A study of self-reported surgical site infection post total hip or total knee replacement

Clare-Louise Sandell

This thesis is submitted in partial fulfilment of the requirements for the award of the Degree of Professional Doctorate in Nursing of the University of Portsmouth

September 2012
ABSTRACT

Background: Currently there is little published evidence exploring the experience of post discharge surgical patients who have developed infection following hip and knee joint replacement surgery. This mixed methods study used both quantitative (Phase One) and qualitative methodologies (Phase Two) to explore the experience of patients with self-reported surgical site infection.

Methods: Phase One- used a researcher developed postal questionnaire to identify the incidence of self-reported surgical site infection at six weeks post surgery as well as investigating the patient’s experience of diagnosis, treatment and outcome following surgical site infection. Phase Two- Recruited from Phase One, twenty-three patients were recruited from Phase one and invited to participate in one to one unstructured, audio taped qualitative interviews. Guided by a Husserlian phenomenological approach to data collection and analysis informed by Colaizzi’s method of data analysis, nine patients shared their lived experience of developing an infection post surgery.

Findings: Phase One - A total of 523 patients were identified at one NHS health trust and after exclusions questionnaires and stamped addressed envelopes were posted to 505 patients six weeks following either total hip or total knee replacement surgery. A response rate of 88.5% led to a final analysis of 447 questionnaires to reveal that 23 (or 5.1%) patients developed a surgical site infection, seven in total hip replacement and 16 in total knee replacement patients. Ten infections were identified prior to discharge and 13 post discharge. Only six of the 23 patients were first seen by a hospital practitioner after suspecting a surgical site infection. Four patients sought review by their General
Practitioner who then referred them onto a hospital practitioner. The remaining 13 patients utilised a combination of different management pathways. In Phase Two analysis of the nine verbatim transcriptions revealed five main themes of (1) Vulnerability, (2) Perception of infection, (3) Significant event (4) Yo yoing and (5) Pendulum of care.

**Discussion:** Comparisons between current national surveillance methods and those utilised in the study identified that current surveillance methods are likely to under represent the total number of self-reported surgical site infections that develop within the six week post operative period. It appears that patients with a surgical site infection experience a number of different management pathways that do not always reflect recommended guidelines. In addition, together the five themes highlight the distress and powerlessness that patients can experience on a journey of surgical site infection within the delivery of current local NHS infection management pathways.
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abstract</td>
<td>i</td>
</tr>
<tr>
<td>Table of Contents</td>
<td>iii</td>
</tr>
<tr>
<td>Declaration</td>
<td>xi</td>
</tr>
<tr>
<td>List of Tables</td>
<td>xii</td>
</tr>
<tr>
<td>List of Figures</td>
<td>xiv</td>
</tr>
<tr>
<td>List of Appendices</td>
<td>xv</td>
</tr>
<tr>
<td>Abbreviations</td>
<td>xvi</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>xvii</td>
</tr>
<tr>
<td>Dissemination</td>
<td>xviii</td>
</tr>
</tbody>
</table>

## CHAPTER 1: INTRODUCTION

1

## CHAPTER 2: LITERATURE REVIEW

4

2.1 Background

4

2.2 Causes of joint destruction

5

2.3 Treatment options

6

2.3.1 Non surgical treatment options

7

2.3.2 Considerations in surgical treatment

8

2.4 Benefits of total hip or total knee replacement surgery

9

2.5 Potential complications of surgery

11

2.6 Infection

12

2.6.1 Nosocomial Surgical Site Infection Surveillance Service (NSSISS)

12

2.6.2 Classifying infections in joint replacement surgery

13

2.7 Risk factors for infection

14
2.7.1 Development of infection
2.7.2 Defining surgical site infection
2.7.3 Identification of infection
2.7.4 Management of acute infection

2.8 Ways of measuring surgical site infection
2.8.1 International surveillance
2.8.2 National surveillance

2.9 Implications of surgical site infection
2.9.1 Personal financial impact
2.9.2 Organisational financial impact
2.9.3 Physical impact
2.9.4 Psychological impact

2.10 Rationale for study
2.10.1 Rationale for Phase One: six weeks post-surgery surgical site surveillance
2.10.2 Rationale for Phase Two: exploration of the lived experience of having a self-reported surgical site infection

2.11 Research Design
2.11.1 Research philosophy
2.11.2 Research paradigms
2.11.3 Mixed Methods

CHAPTER 3: QUANTITATIVE METHODOLOGY PHASE ONE POST DISCHARGE SURVEILLANCE QUESTIONNAIRE
3.1 Introduction
3.1.1 Aims and objectives
3.1.2 Ethics
3.1.3 Research governance

3.2 Phase One - Research Method

3.2.1 Questionnaires

3.2.2 Development of questionnaire

3.2.2.1 Response rates

3.2.2.2 Questionnaire design and layout

3.2.2.3 Question phrasing

3.2.2.4 Questionnaire pilot and revision

3.2.3 Sampling and Recruitment

3.2.3.1 Sample

3.2.3.2 Recruitment

3.2.4 Data coding

3.2.4.1 Data entry validation.

3.2.4.2 Data analysis

3.3 Results

3.3.1 Patients identified as having undergone total hip or knee surgery between 27/09/09 – 26/09/10

3.3.2 Study participants who self-reported a post operative surgical site infection

3.3.3 Reported time frames of surgical site infections from study participants

3.3.4 Length of stay

3.3.5 Details of wound discharge characteristics as identified by study participants reporting an infection post joint replacement

3.3.6 Study participant reported contact with healthcare professionals consequent to identification of post surgical infection

3.4 Summary of results
3.5 Discussion of Phase One

3.5.1 Comparison between local and national demographics 82
3.5.2 Comparison of local to national infection rates 82
3.5.3 Time frame from surgery to identification of infection 83
3.5.4 Length of stay 84
3.5.5 Wound characteristics 85
3.5.6 Management pathways 87

CHAPTER 4: PHASE TWO PHENOMENOLOGICAL INVESTIGATION INTO THE LIVED EXPERIENCE OF HAVING A SURGICAL SITE INFECTION

4.1 Introduction 89
4.2 Methodology 90
4.3 Phenomenology 92
  4.3.1 Husserlian phenomenology 92
  4.3.2 Heideggarian phenomenology 93
4.4 Husserlian transcendental phenomenology 93
  4.4.1 Husserl’s phenomenological framework 94
  4.4.2 Intentionality 95
4.5 Method 96
  4.5.1 Ethics 96
  4.5.2 Patient selection 96
  4.5.3 Phenomenological reduction: stage one 98
    4.5.3.1 Bracketing of previous knowledge 99
    4.5.3.2 Transcendental consciousness 103
  4.5.4 Description and essence 104
4.6 Data collection

4.6.1 Unstructured interview schedule
4.6.2 Practice interview
4.6.3 Interview venue
4.6.4 Consent to interview
4.6.5 Audio taping
4.6.6 Verbatim transcription

4.7 Data analysis

4.7.1 Step one: familiarisation with data
4.7.2 Step two: extraction of significant statements
4.7.3 Step three: formulated meanings
4.7.4 Step four: meaning clustered into themes
4.7.5 Step five: descriptions of themes
4.7.6 Step six: identification of fundamental structures
4.7.7 Step seven: validation of findings

4.8 Reflexivity
4.9 Findings
4.10 Themes

4.10.1 Theme: Vulnerability
4.10.1.1 Sub theme: Loss of control
4.10.1.2 Sub theme: Fear
4.10.1.3 Sub theme: Despair/ dread
4.10.1.4 Sub theme: Benchmarking
4.10.1.5 Sub theme: Fretting
4.10.1.6 Sub theme: Isolation
4.10.1.7 Sub theme: Burden
4.10.1.8 Discussion of vulnerability

4.10.2 Theme: Perception of infection
4.10.2.1 Sub theme: previous knowledge/experience of infection
4.10.2.2 Sub theme: symptoms/treatment of infection
4.10.2.3 Sub theme: interaction with healthcare professionals
4.10.2.4 Discussion of perception of infection

4.10.3 Theme: Significant event
4.10.3.1 Discussion of significant event

4.10.4 Theme: Yo Yoing
4.10.4.1 Discussion of Yo yoing

4.10.5 Theme: Pendulum of care
4.10.5.1 Sub theme: caring environment
4.10.5.2 Sub theme: care givers and experience of care
4.10.5.3 Discussion of pendulum of care

4.11 Summary of findings

4.12 Evaluation of qualitative methodology used
4.12.1 Credibility
4.12.2 Transferability
4.12.3 Dependability
4.12.4 Confirmability

CHAPTER 5: DISCUSSION
5.1 Introduction

5.2 Surgical site infection: surveillance
5.2.1 Surveillance period 162
5.2.2 Surveillance data 162
5.3 Infection rates: locally extrapolated from national surveillance data 164
5.3.1 Wounds 165
5.4 Financial implications 166
5.5 Management of acute infection 168
5.5.1 Management process 168
5.6 Patient experience 171
5.6.1 Vulnerability 174
5.6.2 Perception of infection 174
5.6.3 Significant event 175
5.6.4 Yo yoing 175
5.6.5 Pendulum of care 176
5.7 Personal preconceptions and the lived experience of surgical site infection 178
5.8 Summary 179
5.9 Limitations 180
5.9.1 Island perspective 180
5.9.2 Phase One: cross-sectional survey 181
5.9.3 Phase Two: qualitative interviews 185
5.10 Conclusions and recommendations for future practice 187

CHAPTER SIX: PERSONAL REFLECTIONS 192
6.1 Introduction 192
6.2 Personal reasons for undertaking a professional doctorate 193
6.3 Personal incentives behind research undertaken 195
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4 Reflections on the research process</td>
<td>196</td>
</tr>
<tr>
<td>6.5 Dissemination</td>
<td>198</td>
</tr>
<tr>
<td>6.6 Personal journey</td>
<td>199</td>
</tr>
<tr>
<td>6.7 Conclusion</td>
<td>201</td>
</tr>
</tbody>
</table>

REFERENCES 202

APPENDICES 220
Declaration

Whilst registered as a candidate for the above degree, I have not been registered for any other research award. The results and conclusions embodied in this thesis are the work of the named candidate and have not been submitted for any other academic award.

Word Count: 47, 626
# LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>Frequent indications for joint replacement surgery</td>
<td>6</td>
</tr>
<tr>
<td>2.2</td>
<td>Overview of implant type and five year survivorship data</td>
<td>8</td>
</tr>
<tr>
<td>2.3</td>
<td>Co-morbidity risk factors that can increase the risk of surgical site infection</td>
<td>15</td>
</tr>
<tr>
<td>2.4</td>
<td>Individual patient risk factors that can increase the risk of developing surgical site infection</td>
<td>15</td>
</tr>
<tr>
<td>2.5</td>
<td>Environmental risk factors that can increase the risk of developing surgical site infection</td>
<td>16</td>
</tr>
<tr>
<td>2.6</td>
<td>Procedure specific factors that can increase the risk of developing surgical site infection</td>
<td>16</td>
</tr>
<tr>
<td>2.7</td>
<td>Showing a selection of surveillance methods used in the reporting of surgical site infection internationally</td>
<td>27</td>
</tr>
<tr>
<td>2.8</td>
<td>Ontological and epistemological stance in relation to research philosophy as presented by Crotty (1998)</td>
<td>42</td>
</tr>
<tr>
<td>2.9</td>
<td>The four perspectives of mixed method research as presented by Creswell and Tashakkori (2007) and Creswell and Garrett (2008)</td>
<td>46</td>
</tr>
<tr>
<td>2.10</td>
<td>The six main mixed method designs presented by Creswell and Plano Clark (2011)</td>
<td>47</td>
</tr>
<tr>
<td>3.1</td>
<td>Breakdown of questions included in questionnaire</td>
<td>61</td>
</tr>
<tr>
<td>3.2</td>
<td>Number of primary total hip and total knee replacement operations undertaken over a three year period</td>
<td>63</td>
</tr>
<tr>
<td>3.3</td>
<td>Details of study patients identified as having undergone primary total hip or primary total knee replacement (n=523) between 27/09/09-26/09/10</td>
<td>67</td>
</tr>
<tr>
<td>3.4</td>
<td>Details of identified study participants not included in final results of questionnaire analysis (n=76)</td>
<td>68</td>
</tr>
<tr>
<td>3.5</td>
<td>Details of Study participant reporting a surgical site infection</td>
<td>71</td>
</tr>
<tr>
<td>3.6</td>
<td>Number of self-reported surgical site infections</td>
<td>72</td>
</tr>
<tr>
<td>3.7</td>
<td>Procedure specific average length of stay comparing patient reported infection to non infection in relation to total cases</td>
<td>73</td>
</tr>
</tbody>
</table>
3.8: Number of patients self-reporting wound discharge 74

3.9: Description of self-reported wound discharge (n=15) 74

3.10 Results of specimens taken from 6 out of the 15 patients who identified specimens had been taken and who reported a surgical site infection. 76

3.11 Order of visits to healthcare professionals (reported by patients noting wound infection following total hip or total knee replacement) n=23 78

3.12 Comparison between methods used by National Surgical Site Infection Service and the present study 82

4.1 The four main processes involved in Husserlian phenomenology as presented by Priest (2002) 95

4.2 Interview patient Characteristics and interview location 98

4.3 Colaizzi’s seven steps of phenomenological analysis (Colaizzi, 1978) 111

6.1 Future plans for dissemination of research findings 199
LIST OF FIGURES

2.1: Definitions of Surgical Site Infections (Taken from the Health Protection Agency Protocol for surveillance of surgical site infections, July 2008) 19

2.2: Algorithm outlining the management pathway for infected total joint replacement (taken from Moran et al, 2010, p.50) 23

2.3: Algorithm outlining diagnostic and therapeutic interventions in the management of early prosthetic joint infections (taken from Mathews et al, 2009, p.1379) 24

3.1: Flow chart showing the method of data collection 65

3.2: Participant flow through Phase One of the study 70

4.1: Flowchart of participants through Phase Two of the study 97

4.2: Example of the transition from verbatim text to Formulated Meaning 113

4.3: Diagrammatic representation of 23 of the 67 formulated meaning aggregated into five themes generated 115

4.4: Summary of data analysis process 121

4.5: Five emergent themes with arrows identifying interconnection between themes 123

4.6: Diagrammatic representation of the links between the emergent themes of vulnerability, pendulum of care and perception of infection. 153

5.1: Identifying the difference between current national surveillance methods and surveillance methods utilised in Phase One of the study presented (difference circled) 163

5.2: Showing the number of locally acquired additional surgical site infections identified through post discharge surveillance in addition to re-admission data 164

5.3: A comparison of the similarities between a personal representation of illness as presented by Donaldson et al, (2007, p.536) and emergent themes identified in this study 173
<table>
<thead>
<tr>
<th>Appendix</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix 1</td>
<td>Letter offering conditional ethics approval</td>
<td>220</td>
</tr>
<tr>
<td>Appendix 2</td>
<td>Letter offering full ethics approval</td>
<td>225</td>
</tr>
<tr>
<td>Appendix 3</td>
<td>Letter offering confirmation to proceed from local research governance unit</td>
<td>229</td>
</tr>
<tr>
<td>Appendix 4</td>
<td>Patient questionnaire</td>
<td>231</td>
</tr>
<tr>
<td>Appendix 5</td>
<td>Introductory letter to accompany questionnaire</td>
<td>235</td>
</tr>
<tr>
<td>Appendix 6</td>
<td>Algorithm for pathway of orthopaedic patients with surgical wound problems following total hip or total knee replacement surgery</td>
<td>237</td>
</tr>
<tr>
<td>Appendix 7</td>
<td>Introductory letter inviting participants to Phase 2 of the study</td>
<td>239</td>
</tr>
<tr>
<td>Appendix 8</td>
<td>Patient interview information leaflet</td>
<td>241</td>
</tr>
<tr>
<td>Appendix 9</td>
<td>An overview of my personal reflections and preconceptions relating to infection following joint replacement surgery</td>
<td>246</td>
</tr>
<tr>
<td>Appendix 10</td>
<td>Unstructured interview schedule</td>
<td>249</td>
</tr>
<tr>
<td>Appendix 11</td>
<td>Significant statements with formulated meanings attached</td>
<td>251</td>
</tr>
<tr>
<td>Appendix 12</td>
<td>Formulated meanings aggregated into themes</td>
<td>258</td>
</tr>
<tr>
<td>Appendix 13</td>
<td>Learning objectives</td>
<td>262</td>
</tr>
</tbody>
</table>
Abbreviations

ASA- American Society of Anaesthesiologist
CDC- Centre for Disease Control
CNS- Coagulase Negative Staphylococci
CRP- C Reactive Protein
DOH- Department of Health
ESR- Erythrocyte Sedimentation Rate
GP- General Practitioner
HAISSG - Healthcare Associated Infections Surveillance Steering Group
HPA- Health Protection Agency
MRSA- Methicillin Resistant Staphylococcus aureus
NHFD- National Hip Fracture Database
NIHCE- National Institute for Health and Clinical Excellence
NICE- National Institute for Clinical Excellence
NHS- National Health Service
NSSISS- National Surgical Site Infection Surveillance Service
NSSIS- National Surgical Site Infection Surveillance
NJR- National Joint Registry
OPCS-4- Office of Population, Census and Surveys Classification Codes -4th Revision
PAS- Patient Administration System
SENIC- Study on the Efficacy of Nosocomial Infection Control
SD- Standard Deviation
SSI- Surgical Site Infection
UK- United Kingdom
USA- United States of America
Acknowledgements

I would like to thank Dr Ann Dewey and Dr Rebecca Stores for their roles as academic supervisors. Their support and guidance has been invaluable to me as I progressed along this doctoral journey.

I would like to offer sincere and heartfelt thanks to my two clinical supervisors, Dr Debbie Cumming and Mr Jonathan Gardiner, who have been extremely generous in offering their time, continual support and guidance, which helped me through some challenging times.

Thanks are also due to my fellow doctoral students Jill Addis and Jaki Metcalfe who offered an ear when necessary and acted as a sounding board throughout the programme.

My colleagues at work have supported, encouraged and given time to allow me to take this journey and I wish to thank them one and all.

Finally, and by no means lastly, I wish to offer love and thanks to my family, who have always provided support whilst accepting, with good grace, my long absences from their lives, especially over the last few months.
Dissemination

The Arthroplasty Care Practitioners Association, Patient reported surgical site infection: Torquay, March 2011.
CHAPTER 1: INTRODUCTION

The study presented in this thesis has two main objectives. Firstly, to identify the incidence and management of patients who self-report a surgical site infection, within six weeks of total hip or total knee replacement. Secondly, to explore the lived experience of some of these patients who self-report a surgical site infection. This research study was carried out at a south coast District General Hospital serving a population of about 140,000. The greater proportion of the population using this hospital was aged 65 years or more compared to the rest of England and Wales (Isle of Wight Council, 2012).

In exploring the impact of surgical site infection (SSI) on the individual and the healthcare organisation, two different research methods were used to collect relevant data. Firstly, using quantitative methodology, surgical site surveillance utilised a post discharge questionnaire to identify the incidence of self-reported infection, within six weeks, following total hip or total knee replacement surgery. Secondly, qualitative methodology informed by a descriptive phenomenological approach utilised patient interviews to explore the lived experience of those with a self-reported surgical site infection.

Chapter 2 presents an overview of the literature in relation to total hip and total knee replacement surgery (in sections 2.0 to 2.4). This includes presenting the number of total hip and total knee replacement procedures undertaken within the United Kingdom as well as a discussion around the indications for, and potential benefits of, this type of surgery. The patient’s perspective in terms of issues such as pain, quality of life and ability to work is also discussed.
Following this, sections 2.5 to 2.9 focus specifically on the literature relating to infection following total hip and total knee replacement surgery, divided into four main areas. The first section discusses the potential influences on the incidence of infection specifically related to patient co-morbidities, individual risk factors and environmental risk factors. The next section discusses how infections (involving joint replacements) develop and are identified as well as the recommended management pathways. Following on, there is a discussion around current practice in relation to defining and measuring surgical site infection. Finally, the implications of surgical site infection for the patient are explored including physical, psychological and social aspects. The financial impacts to healthcare organisations are also discussed. A summary of the chapter follows, leading to a presentation of the rationale for the proposed study.

Chapter 3 describes Phase One of the research. This chapter documents the development and distribution of a post discharge surveillance questionnaire which was used to identify the incidence of patient reported surgical site infection. The questionnaire explored several domains relating to diagnosis, management and treatment of their surgical site infection; the results of which are presented and discussed.

Chapter 4 describes Phase Two of the research. This phase used a qualitative, descriptive approach to explore the lived experience of patients with a self-reported surgical site infection. Descriptive phenomenological methods, following Husserlian philosophies, were utilised to provide the framework for this
second phase of the study. Data was collected using audio-taped one to one interviews with a small sub-section of patients who self-reported a surgical site infection in Phase One of the study. The data was analysed using Colaizzi’s framework appropriate for descriptive phenomenological data. The findings are presented and discussed in terms of the five main themes generated from the nine interview transcripts.

Chapter 5 presents an overall discussion of the results and findings of both Phase One and Phase Two of this study. This discussion places the results of both Phase One and Phase Two within the context of current healthcare provision. This chapter also incorporates reference to the relevance of the methods used to address this exploratory research and discusses the limitations identified within this study. In concluding, this chapter discusses the findings in relation to current clinical practice and identifies potential future research needs.

Chapter 6 contains a reflective account on the professional doctoral programme and, in particular how this journey has influenced my personal, professional and clinical role as a practitioner-researcher.
CHAPTER 2: LITERATURE REVIEW

This Chapter reviews the literature relating to hip and knee joint destruction, and introduces both non surgical and surgical treatment options. It also briefly presents the potential post operative complications that can arise. The focus of this research study is the identification and subsequent management of the post-operative complication of infection. Therefore the issues around risk factors for infection; how infections in joint replacement develop as well as identification of infection are presented. The national guidelines on the management pathways for suspected/identified surgical site infections in joint replacement patients are discussed. The current methods for monitoring the incidence of surgical site infection (surveillance) are reviewed. Finally literature relating to the impact of infection on the individual, as well as, the healthcare organisation, is presented.

2.1 Background

During 2009, over 70,000 hip replacement and 75,000 knee replacement procedures were performed in England and Wales according to the National Joint Registry (NJR) (NJR, 2010). Joint replacement surgery has revolutionised the care of patients with end stage arthritis to improve quality of life by restoring function and reducing pain (Burns and Bourne 2006; Saleh et al, 2002). It is not surprising, therefore, that the number of hip and knee replacement procedures performed is continuing to increase year on year.

During 2009 according to the National Joint Registry (2010) 56% of primary total hip replacements were undertaken on women with a mean aged of 67 yrs
(SD13.33). Similar figures were presented with regard to total knee replacement procedures, again suggesting that 56% of those undertaken were on women with a mean age of 67 years (SD 11.87) (National Joint Registry, 2010). There is, however, evidence that this age demographic may change considerably in future years. Papers such as that presented by Kurtz et al (2009) using figures from the USA, extrapolated that the demand for primary joint replacement surgery in patients less than 65 years old would increase 50% by 2016. There are a number of potential explanations for this increase in demand. These include the innovations occurring in implant technology that allow longer implant survivorship. There have been reports that UK experts attribute this rise in demand to be partly due to the increasing obesity problem placing increased strain on the knees (Roberts, 2012). However with the increases in younger patients receiving joint replacements, either because of the increasing incidence of obesity or due to innovations in implant design, and a population that is ageing, the number of joint replacements undertaken over the subsequent years is likely to continue to increase quite considerably over the next decade.

### 2.2 Causes of joint destruction

There are many predisposing factors that lead to joint destruction; osteoarthritis being the primary cause. Table 2.1 identifies the five most frequent causes of joint destruction that result in the necessity for joint replacement surgery.
Table 2.1: Frequent indications for joint replacement surgery

<table>
<thead>
<tr>
<th>Condition causing joint destruction</th>
<th>Percentage of joint replacement undertaken for related condition*</th>
<th>Aetiology</th>
</tr>
</thead>
</table>
| Osteoarthritis                      | 93% Total hip replacements 97% Total knee replacements          | • Degeneration of articular cartilage  
• Intra-articular inflammation manifested by synovitis and subchondral bone changes. |
| Inflammatory arthritis              | <1% Total hip replacements** 1% Total knee replacements       | • Chronic auto-immune disease characterised by inflammation of the joints  
• Frequently accompanied by marked deformities of the joint |
| Developmental hip dysplasia         | <1% Total hip replacements** | • Abnormal development of the hip joint usually referred to as developmental dysplasia |
| Miscellaneous                       | 6% Total hip replacements 2% Total knee replacements           | • Traumatic arthritis  
• Joint destruction from conditions such as Perthes disease |

* Percentages taken from National Joint Registry for England and Wales 7th Annual Report 2010
** Numbers have been rounded up to the nearest whole number

The number of primary joint replacements is also anticipated to rise significantly above current trends due to recent recommendations from the National Institute for Health and Clinical Excellence (NIHCE) regarding patients with a fractured neck of femur. Their recommendation is that patients with displaced intracapsular fractured neck of femur, who are independently mobile, not cognitively impaired and medically fit, should receive a total hip replacement as the treatment of choice rather than the hemiarthroplasty currently used (NIHCE, 2011). According to the National Hip Fracture Database data this potentially means a further 24,757 more total hip replacements being undertaken every year (National Clinical Audit and Patient Outcome Programme, 2011).

2.3 Treatment options

The NICE guidelines on the management of osteoarthritis in adults recommend an approach that encompasses a holistic assessment of the individual rather than just considering the joint(s) affected in isolation. This holistic assessment
includes reviewing social, psychological, occupational, musculoskeletal, general health and pain management (to take into account an individual's needs and preferences), before putting treatment plans in place (NICE, 2008a). The treatment options that arise for patients experiencing the effects of osteoarthritis can be broadly divided into non-surgical and surgical treatment options.

2.3.1 Non-surgical treatment options

The NICE guidelines on the management and care of osteoarthritis in adults (NICE, 2008a) are based on recommendations made by the National Collaborating Centre for Chronic Conditions and present recommendations for management based on systematic reviews of the current literature. Treatment options are presented in three phases:

- Core treatments, incorporating education/exercise and if indicated weight loss.
- Relatively safe pharmaceutical options, including paracetamol and topical non-steroidal anti-inflammatory preparations.
- Adjunctive treatments, including additional pharmaceutical options (oral non-steroidal anti-inflammatory, opioids, intra-articular injections and topical application of capsaicin), self-management techniques (such as thermotherapy), non-pharmaceutical treatments (supports, braces, insoles, transcutaneous electrical nerve stimulation, and manual therapy).

When non-surgical treatment is no longer effective or the disease has progressed to such an extent, that increasing pain and loss of function result in a negative impact on the quality of life, surgical treatments may be considered. Desmeules, Dionne, Belzile, Bourbonnais and Frémont (2009) explored the
quality of life experiences for patients waiting for total knee replacement. Using the SF-36 health related quality of life survey they found that out of the 197 patients studied, besides the reduction in physical ability, associated with the impact of arthritis, there was also a reduction in the mental health welfare of this patient group. Functional limitations, pain and reduction in health related quality of life places a significant burden on the individual coping with the personal impact of arthritis (The National Collaborating Centre for Chronic Conditions, 2008).

2.3.2 Considerations in surgical treatment

When the decision to proceed to surgical treatment has been made; agreed both by the patient and the surgeon, the surgeon will select the type of implant to be used for the individual patient. There are a wide variety of implants available to use for both hip and knee replacement surgery. Table 2.2 summarises general features of implant types and outlines the current survivorship based on revision rates at five years post surgery.

Table 2.2: Overview of implant type and five year survivorship data

<table>
<thead>
<tr>
<th>Implant type</th>
<th>Features</th>
<th>Survivorship based on revision rates at 5 yrs post surgery (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cemented hip replacement</td>
<td>Both components are cemented implanted</td>
<td>95.6%</td>
</tr>
<tr>
<td>Uncemented hip replacement</td>
<td>Both components are inserted without the use of cement</td>
<td>96%</td>
</tr>
<tr>
<td>Hybrid hip replacement</td>
<td>Only one component is cemented the other is uncemented</td>
<td>97.4%</td>
</tr>
<tr>
<td>Cemented knee replacement</td>
<td>Both components are cemented implanted</td>
<td>97%</td>
</tr>
<tr>
<td>Uncemented knee replacement</td>
<td>Both components are inserted without the use of cement</td>
<td>96.3%</td>
</tr>
<tr>
<td>Hybrid knee replacement</td>
<td>Only one component is cemented the other in uncemented</td>
<td>95.8%</td>
</tr>
<tr>
<td>Partial joint replacement (unicondylar knees)</td>
<td>Only one part of the joint articulation is replaced</td>
<td>90.6%</td>
</tr>
</tbody>
</table>

Data taken from the National Joint Registry 7th Annual Report 2010.
The choice of which type of implant to use is determined by the surgeon, who will consider:

- Data relating to the long term function of specific implant types (identified through survivorship data such as that presented in Table 2.2)
- Information included in the National Institute for Clinical Excellence Guidance on the selection of prosthesis for primary hip replacement, 2000)
- Extent of the disease in relation to bone destruction
- Quality of bone stock
- General age/ fitness of the patient, and
- Surgeon preference, based on their own surgical competence and experience with particular implants.

2.4 Benefits of total hip or total knee replacement surgery

There have been a number of international studies that have reported patient benefit in terms of functioning and quality of life measurements following total hip or total knee replacement surgery. Evaluative studies undertaken in the United States, using a prospective cohort design, evaluated the effect of joint replacement surgery on patients whose osteoarthritis symptoms were not controlled by conservative methods (Hamel, Toth, Legedza & Rosen (2008). They utilised several validated scoring tools to evaluate pain, function and stiffness in osteoarthritis (WOMAC index), general health (SF-12) and additional functional outcome (modified Katz basic activities of daily living (BADL) on the clinical outcomes of joint replacement surgery of the hip and knee, compared to those who did not undergo surgery. They found that there was a significant
improvement (p>.001) in both WOMAC scores and the SF-12 in the post surgical group.

March et al (1999) compared health-related quality of life, using the SF-36, reported the results of a prospective cohort study pre and post surgery undertaken in Australia. They found that (irrespective of age at time of surgery) significant improvements in patient reported health related quality of life scores (in all domains except general and mental health) were shown at 12 months post surgery (Lin et al, 1999). Other data, collected from the Swedish Hip Arthroplasty register (again using patient reported outcomes) following hip replacement, showed that at one year following surgery, patient’s health related quality of life had been restored to the level expected for their age and gender (Rolfson, Kärrholm, Dahlberg & Garelick, 2011).

Suda, Seeger, Bitsch, Krueger and Clarius (2010) suggest that total hip replacement is the most successful procedure undertaken in orthopaedic surgery, revolutionising the management of elderly patients with arthritis. Their study, undertaken in Germany, evaluated the pre-operative expectations of this patient group compared to outcome, but this time at three years post surgery. Of the 130 patients questioned in this study (70 total hip and 60 total knee replacement) 63% of those who responded felt their expectations had either been met or exceeded, in terms of functional ability following surgery. The other 37%, although indicating that their expectations regarding outcome following surgery were not met, did not exhibit a lower functional score than those who were satisfied.
However there are differences in the way in which German healthcare is provided. Germans can choose to see whichever doctor they like, whether its a choice of general practitioner (GP) or specialist without prior GP referral or scheduled appointment (Gold, 2011). In this study, the population of n=130 chose to attend a centre of excellence and, as such, the findings may not represent those attending other centres that are not performing as well. Secondly, the questionnaire used was a modified form of the validated Functional Questionnaire of Hannover for Osteoarthritis (FFbH-OA) to ascertain patient’s expectations following hip and knee arthroplasty. However, there is no discussion regarding the issues of how modification has resulted in changes that may have affected validity measures of either content or face validity, or both since these issues are not discussed within the paper.

Despite the considerable successes associated with joint replacement surgery, as with any surgical procedure, there is always the potential for post-operative complications.

### 2.5 Potential complications of surgery

Some of the potential complications of hip and knee joint replacement are similar to those associated with any surgical intervention, namely surgical site infection (either superficial incisional, deep incisional or organ/space), venous thromboembolism (a blood clot that forms within a vein), and residual pain at the surgical site. There are also potential complications, associated specifically with hip replacement surgery, related to a potential leg length difference and the risk of dislocation of the joint following surgery. This literature review will focus on the complication of infection following joint replacement surgery.
2.6 Infection

Nosocomial infections, an infection acquired by a patient who was admitted for a reason other than that infection, including infections that appear following discharge (World Health Organisation, 2002) are a major public health problem worldwide and attract significant media interest (Hernandez, Ramos, Seas, Henostroza & Gotuzzo, 2005). Reid, Simcock, Chrisholm, Dobbs and Frizelle (2002) present surgical postoperative wound infections as the second most common nosocomial infections reported. In the United States surgical site infection equates to 17% of all healthcare associated infections (United States Department of Health and Human Services, 2012). In the United Kingdom for 2006 the National Institute for Clinical Excellence presented a figure of 8% of all hospital admissions developing a hospital acquired infection, of which 14% were surgical site infection (NICE, 2008b). One year later, Wilson, Ramboer and Suetens (2007) reported surgical site infection as ranging between 11%-26% of all hospital acquired infections. These results included data from a variety of hospitals across Europe, which may go some way to explain higher reported rates of infection. The cost of surgical site infection, across all surgical specialities, was estimated to be £61 million per year in the United Kingdom alone (Reilly, Allardice, Bruce, Hill & McCoubrey, 2006); costs relate mainly to prolonged in-patient stays and additional treatment costs.

2.6.1 Nosocomial Surgical Site Infection Surveillance Service (NSSISS)

The Health Protection Agency reports the results of the Nosocomial Surgical Site Infection Surveillance Service (NSSISS) in the United Kingdom. The NSSISS collects data related to the number of surgical site infections that develop within a 30 day period post surgery. Currently it is only mandatory to
submit data to the NSSISS on infections that develop during the inpatient stay or, where patients are readmitted for surgical site infection within the 30 day post surgical period.

Estimates of infections associated with the surgical intervention of hip or knee replacement provide some indication of incidence of surgical site infection. Data from the Nosocomial Surgical Site Infection Surveillance, related to joint replacements, for 2009/10 highlighted that of the 65,647 joint replacements reported during this period the overall surgical site infection rate was estimated to be 1.17% (Health Protection Agency, 2010). However this data does not represent continuous surveillance as it is currently only mandatory to submit data for a three month period within a calendar year. Therefore seasonal fluctuations and clusters of infections may not have been identified within this data.

Difficulties associated with making any useful comparisons between surgical site infection data within the literature stem largely from the variety of methods, time frames and criteria used to identify infection. These methodological issues are revisited in relation to current surgical site infection surveillance in section 2.8.

2.6.2 Classifying infections in joint replacement surgery

For hip and knee replacement surgery, infection can be further classified either as deep or superficial wound infection, but also with respect to when the infection was detected. The definitions of what constitutes a superficial or deep wound infection are presented below:
- Superficial infection: defined as an infection occurring within 30 days of surgery, involving only skin and subcutaneous tissue
- Deep infection: defined as involving fascia and muscle layers that occurs within one year of surgery (when the infection relates to the original area of surgery and involves a prosthetic implant)

(Health Protection Agency, 2008)

Having classified surgical site infection following joint replacement surgery, factors that may influence the likelihood of a particular patient developing a postoperative surgical site infection will now be discussed.

### 2.7 Risk factors for infection

The risk factors that may increase the likelihood of an individual patient developing a surgical site infection following total hip or total knee replacement surgery will now be briefly outlined. These are presented in relation to pre-existing co-morbidities, individual patient factors and environmental risk factors. Table 2.3 gives examples of patient co-morbidities and how these can increase the risk of surgical site infection.
Table 2.3: Co-morbidity risk factors that can increase the risk of surgical site infection

<table>
<thead>
<tr>
<th>Co-morbidity</th>
<th>Influencing factor</th>
<th>Key supporting references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes</td>
<td>Delayed collagen synthesis and decreased wound strength</td>
<td>Vince, Chivas and Droll (2007)</td>
</tr>
<tr>
<td></td>
<td>Hyperglycaemia causes the release of pro-inflammatory mediators that depress the immune system increasing susceptibility to bacterial infections</td>
<td>Kao, Lally and Moyer (2008)</td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td>Rheumatoid arthritis patients are Immunocompromised as a result of disease process</td>
<td>Cook, Scott and Long (2007); Mokete and Naudie (2006)</td>
</tr>
<tr>
<td></td>
<td>The disease modifying drugs used to treat rheumatoid arthritis potentiate the increased risk of infection</td>
<td>Pieringer, Stuby and Biesenbach (2007)</td>
</tr>
<tr>
<td>Obesity</td>
<td>Increases the risk of other associated co-morbidities such as diabetes</td>
<td>Andrew, Pala, Kurup, Murray and Beard (2008)</td>
</tr>
<tr>
<td></td>
<td>Causes prolonged wound drainage thereby increasing potential for infection</td>
<td>Patel et al (2007)</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>Increased risk of infection but specific rationale not presented</td>
<td>Saleh et al (2002); Kamath, Sinha, Shaari, Young and Campbell, (2005)</td>
</tr>
</tbody>
</table>

In addition, Table 2.4 below outlines specific individual patient risk factors that can affect the likelihood of a patient developing a surgical site infection.

Table 2.4: Individual patient risk factors that can increase the risk of developing surgical site infection

<table>
<thead>
<tr>
<th>Individual patient risk factors</th>
<th>Influencing factor</th>
<th>Key supporting references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking</td>
<td>Toxins in inhaled tobacco smoke impair wound healing, nicotine is a vasoconstrictor and the carbon monoxide in tobacco smoke reduces oxygen transportation</td>
<td>Myles et al (2002)</td>
</tr>
<tr>
<td>Local steroid injections</td>
<td>Injecting steroids locally suppresses immune responses</td>
<td>Kaspar and de V de Beer (2005)</td>
</tr>
<tr>
<td>Previous surgery on same site</td>
<td>Skin integrity has already been breached, reduced blood supply due to scar formation</td>
<td>Beadling, (2007)</td>
</tr>
<tr>
<td>Skin and nasal contaminants</td>
<td>Nasal carriers of <em>Staphylococcus aureus</em> have a relative risk of 7.1 for developing surgical site infection</td>
<td>Young and Winston (2006)</td>
</tr>
<tr>
<td></td>
<td>Between 19% and 25% of those colonised with MRSA developed MRSA infections</td>
<td>Nixon, Jackson, Varghese, Jenkins and Taylor (2006)</td>
</tr>
<tr>
<td></td>
<td>Intra operative contamination through transfer of bacteria from skin to surgical site</td>
<td>Davis, Curry, Gambhir, Panigrahi, Walker and Wilkins (1999)</td>
</tr>
</tbody>
</table>

There are environmental factors to which the patient can be exposed that can modify the risk of surgical site infection. Some examples are shown in Table 2.5.
Table 2.5: Environmental risk factors that can increase the risk of developing surgical site infection

<table>
<thead>
<tr>
<th>Environmental Influencing factor</th>
<th>Key supporting references</th>
</tr>
</thead>
<tbody>
<tr>
<td>High bed occupancy Risk of cross infection, inappropriate placement of emergency admissions</td>
<td>Keegan (2008)</td>
</tr>
<tr>
<td></td>
<td>10.3% greater incidence of MRSA when bed occupancy rates exceeded 90%.</td>
</tr>
<tr>
<td>Type of operating theatre Laminar flow theatres, control of airflow in operating theatre by drawing air particles from operating field</td>
<td>Lidwell et al (1982)</td>
</tr>
</tbody>
</table>

Of fundamental importance to the risk of surgical site infection is the actual procedure itself. Examples of modifying factors are shown in Table 2.6.

Table 2.6: Procedure specific factors that can increase the risk of developing surgical site infection

<table>
<thead>
<tr>
<th>Procedure specific Influencing factor</th>
<th>Key supporting references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin preparation Chlorhexadine gluconate disrupts the bacteria at a cell membrane level &amp; long lasting activity against both Gram positive and negative organisms</td>
<td>Fletcher, Sofianos, Berkes and Obremskey (2007)</td>
</tr>
<tr>
<td>Surgical tourniquet Increased tourniquet times increase infection risk because of reduced blood flow and resulting in decreased oxygen profusion to tissue</td>
<td>DiMarcantonio (2007)</td>
</tr>
<tr>
<td></td>
<td>Reusable tourniquets were found to be contaminated with coagulase negative <em>staphylococcus</em>, <em>bacillus</em> and <em>staphylococcus aureus</em></td>
</tr>
<tr>
<td>Antibiotic prophylaxis Antibiotic prophylaxis should be tailored to locally identified pathogens</td>
<td>Scottish Intercollegiate Guidelines Network (SIGN), (2008)</td>
</tr>
<tr>
<td></td>
<td>Timing of doses important, needs to be based on pharmacokinetics of drug and route of administration and should be administered not less than 30 minutes before incision</td>
</tr>
<tr>
<td>Intra and post-operative bleeding Each day there is prolonged wound drainage there is a 42% increase in the incidence of wound infection developing</td>
<td>Patel et al (2007)</td>
</tr>
<tr>
<td></td>
<td>Increased risks of bleeding and wound drainage are good indicators of patients susceptible to developing surgical site infection. Wound drainage and bleeding provide a warm nutrient rich environment in which organisms can flourish.</td>
</tr>
</tbody>
</table>
These tables show examples of risk factors but they are shown in isolation, and with no temporal context. Clearly, the risk actually experienced for any patient will be an overall combination of those factors relevant to their individual circumstances. Co-morbidities such as diabetes and rheumatoid arthritis are risk factors that will be present throughout the patient’s surgical episode. However potentially influencing factors, such as length of time surgery takes and the environmental risk factors, are only pertinent considerations at the time of surgery, and relate specifically to that individual at that specific point in time. There is no consensus in the literature regarding the relative impact of the individual risk factor with respect to causing or contributing to the infectious process.

2.7.1 Development of infection

According to Berendt and Lipsky’s definition infection begins with an encounter between a pathogen and its host where a pathogen invades the host immune system, multiplying within the host tissue eliciting an inflammatory response causing damage to the tissue (Berendt and Lipsky, 2003).

However, in patients who have undergone joint replacement surgery, the introduction of the foreign material, i.e. the implant itself, makes the infection harder to remedy making subsequent treatment more complex. Berendt and Lipsky suggest explanations as to why these infections are hard to treat. The suggestion is that the reduced host defences’ surrounding the prosthetic implant allows a lower bacterial inoculum than normally would be required, to establish an infection (Berendt and Lipsky, 2003). Subsequent to the multiplication of pathogens within the tissue is the development, by the infecting microorganisms, of a mesh of exocellular polysaccharides that produce what is
termed a ‘biofilm’ around the implant (Berendt, 1999). Due to the way in which biofilms form, they can be between 100-1000 times less susceptible to antibiotic treatments. The susceptibility of the biofilm to antibiotic treatment will depend on the molecular make up of each individual biofilm. This reduced susceptibility to antibiotic treatment has the potential to increase the incidence of antimicrobial resistance as different antibiotic therapies fail to penetrate the biofilm that has formed (Samuel and Gould, 2009). The longer the organism remains in contact with the implanted material the greater its potential to generate antibiotic resistance (Childs, 2008). Hence an infection involving an implant is harder to treat than one without.

2.7.2 Defining surgical site infection

Having discussed the risk factors associated with the development of surgical site infections, the next stage is to consider how, within the literature, surgical site infections are defined. The most commonly used definitions of surgical site infection used within the literature is the one presented by the Health Protection Agency (HPA, 2008) that were developed by the Centre for Disease Control (in Atlanta, USA) in 1992 (Horan, Gaynes, Martone, Jarvis & Emori, 1992). These definitions are presented in Figure 2.1.
Superficial incisional infection
This is defined as a surgical site infection that occurs within 30 days of surgery and involves only the skin or subcutaneous tissue of the incision, and meets at least one of the following criteria:

**Criterion 1:** Purulent drainage from the superficial incision.

**Criterion 2:** The superficial incision yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present.

**Criterion 3:** At least two of the following symptoms and signs:
- pain or tenderness
- localised swelling
- redness
- heat

and a. the superficial incision is deliberately opened by a surgeon to manage the infection, unless the incision is culture-negative
or b. the clinician diagnoses a superficial incisional infection.

Deep incisional infection
This is defined as a surgical site infection involving the deep tissues (i.e. fascia and muscle layers) that occurs within 30 days of surgery if no implant is in place, or within a year if an implant is in place and the infection appears to be related to the surgical procedure, and meets at least one of the following criteria:

**Criterion 1:** Purulent drainage from the deep incision but not from the organ/space component of the surgical site.

**Criterion 2:** The deep incision yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present.

**Criterion 3:** A deep incision that spontaneously dehisces or is deliberately opened by a surgeon when the patient has a least one of the following symptoms or signs (unless the incision is culture-negative):
- fever (>38oC)
- localized pain or tenderness

**Criterion 4:** An abscess or other evidence of infection involving the deep incision that is found by direct examination during re-operation, or by histopathological or radiological examination.

**Criterion 5:** Diagnosis of a deep incisional surgical site infection by an attending clinician.

Organ/space infection
This is defined as a surgical site infection involving any part of the anatomy (i.e. organ/space), other than the incision, opened or manipulated during the surgical procedure, that occurs within 30 days of surgery if no implant is in place, or within one year if an implant is in place and the infection appears to be related to the surgical procedure, and meets at least one of the following criteria:

**Criterion 1:** Purulent drainage from a drain that is placed through a stab wound into the organ/space.

**Criterion 2:** The organ/space yields organisms from the culture of aseptically aspirated fluid or tissue, or from a swab and pus cells are present.

**Criterion 3:** An abscess or other evidence of infection involving the organ/space that is found by direct examination, during re-operation, or by histopathological or radiological examination.

**Criterion 4:** Diagnosis of an organ/space infection by an attending clinician

---

Figure 2.1: Definitions of Surgical Site Infections (Taken from the Health Protection Agency Protocol for surveillance of surgical site infections, July 2008)

Not all the published literature uses the Health Protection Agency definitions and there are still a wide variety of measures used to define surgical site
The diagnosis of surgical site infection, because of the lack of a single objective diagnostic test, can vary significantly (Bruce, Russell, Mollison & Krukowski, 2001). This causes difficulty in undertaking comparative analysis between differing studies. This is represented in Fink et al’s paper where the incidence of infections in joint replacement is presented as ranging from 1.1%-12.4%. In this paper the combination of four different studies, using different data collection methodologies, has resulted in such a wide range of infection rates (Fink et al, 2008). This variability between diagnoses is presented as one of the limitations expressed in the literature when evaluating studies looking at surgical site infections, and maybe a reason for such differing ranges of infections presented in the literature.

The difficulty associated with identifying surgical site infection is discussed extensively (in a Health Technology Assessment) by Bruce et al in 2001, addressing the issues associated with the measurement and monitoring of surgical adverse events. Their recommendation, following a systematic review of the literature surrounding surgical site infection definition, is that by utilising the definitions provided by the Centre for Disease Control, the reporting of surgical site infections can be standardised (Bruce et al, 2001).

2.7.3. Identification of infection

The early and prompt identification of infection in patients that have undergone joint replacement is important in securing a successful outcome; usually considered to be that of a mobile patient, who is symptom free with an uncontaminated implant, not requiring further surgery. If infection is suspected then specific tests need to be undertaken to help confirm this diagnosis and
indicate the correct treatment options; a combination of clinical indicators and laboratory investigations are recommended. Clinical indicators are usually a hot, red swollen joint, restriction in range of movement, increasing pain and wound drainage which could consist of blood or serous fluid (Mathews, Berendt, McNally & Byren, 2009). Laboratory investigations include baseline blood tests for inflammatory markers and, where clinically indicated, aspiration of joint fluid for microscopy and culture to help identify which infecting organisms are present (Naidu Maripuri, Debnath, Mehta, Thomas & Wilson, 2007). These baseline blood tests can include erythrocyte sedimentation rate (ESR), C reactive protein (CPR), white cell count (WBC). Firstly, erythrocyte sedimentation rate is the rate at which red blood cells sediment in a period of 1 hour. It is considered to be a non-specific test because increases do not identify exactly where the inflammation is in the body or what is causing it, and also because it can be affected by other conditions besides infections. For this reason, an ESR is typically used in conjunction with other tests such as CRP levels. Secondly, the CRP test is based upon the C reactive protein which is an acute phase protein that is produced by hepatocytes in response to inflammation (Mehra, Langkamer, Day, Harris & Spencer, 2005). The CRP level has been shown to be a sensitive and dependable indicator of orthopaedic sepsis when levels remain elevated or rise after day three post surgery (Gupta, Singh and Soni, 2002). Finally, white blood cells constitute part of the immune system and are involved in defending the body against infection, and as such, are produced in greater quantity when a response to infection is initiated. Following on from the initial blood tests aspiration of joint fluid, involving aseptic removal of fluid from the joint, is recommended as a means of establishing a diagnosis of infection (Naidu Maripuri et al, 2007). However the decision to
aspirate a potentially infected joint replacement is usually clinician based, and each clinician will use their personal experience and judgement before deciding whether to aspirate a joint. As such joint aspiration is not always standard practice as recommended in the guidelines presented.

2.7.4 Management of acute infection

Management options for infections in joint replacements can be complex because management strategies need to be both specifically tailored to the individual (for example consideration of individual co-morbidities that may prevent use of certain antibiotic therapies) and specifically tailored to the infecting organism. However what can be standardised are the appropriate management pathways that clinicians should follow to ensure appropriate and effective care.

The Bone Infection Unit at the Nuffield Orthopaedic Centre in Oxford is well recognised as a centre of excellence when dealing with prosthetic joint infections. Several published papers from this centre outline the correct management pathways that should be followed once infection is suspected. Moran, Byren and Atkins (2010) present a complex management algorithm that details the decision making process regarding the intricacies of complex revision surgery, once infection has been confirmed. Details of this algorithm are presented in Figure 2.2.
Figure 2.2: Algorithm outlining the management pathway for infected total joint replacement (taken from Moran et al, 2010, p.50)

Mathews et al, (2009) however, outline a more succinct plan of care around identification and early management of joint infection. Details of this management algorithm are presented in Figure 2.3. The difference between the two algorithms centres on whether a joint replacement has been diagnosed as infected (Moran et al, 2010) or whether there is suspicion that the joint is infected (Mathews et al, 2009).
Matthews et al.’s algorithm (Figure 2.3) commences at the presentation of the patient with a suspected joint infection and differentiates management interventions depending on the clinical status of the individual in relation to the clinical presentation of the suspected infection. Of interest is that both these papers outline the importance of early recognition of infection including identifying causative infecting organism(s) before commencing any subsequent antibiotic treatment. Recommendations suggest that blood tests including C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR) should be initially undertaken with joint aspiration sent for microscopy and culture to identify the infecting organism(s) (Mathews et al, 2009; Moran et al, 2010). Both algorithms stress that antibiotic therapy should not be commenced until
specimens have been taken for culture since the use of oral or intravenous antimicrobials prior to aspiration will reduce the likelihood that the infecting organism will be isolated during culture (Jacofsky and Campbell, 2006). The importance of correct identification of infecting organisms (to ensure appropriate and successful treatment) is highlighted by the Health Protection Agency National Standard Method document, outlining the processing and bacteriological investigations mentioned above which need to be carried out when there is suspicion of, or need to treat prosthetic joint infection (Health Protection Agency, 2009).

The successful management of acute infections in patients with total hip and total knee replacement surgery is reliant on knowing these management algorithms exist and understanding the processes involved. Betsch, Eggli, Siebenrock, Täuber and Mühlemann (2008) identified that joint infections treated in accordance with the currently recommended algorithms is associated with a significantly better outcome (67% success rate) than when these algorithms were not followed. It could be suggested then that any successful management of post-operative infection would require strong and effective interprofessional communication, especially as this patient group often transverse both primary and secondary care during their treatment. Although at the present time the cross boundary working of healthcare professionals, in relation to the management of prosthetic joint infections, has not been explored in the published literature.
2.8 Ways of measuring surgical site infection

Having discussed the implications of surgical site infection following total hip or total knee replacement, it is necessary to explore how the incidence of surgical site infection is measured. Fundamental, but not exclusive, to assisting in the reduction of the financial burden to healthcare organisations is the importance of utilising appropriate methods for defining, identifying and appropriately managing surgical site infections. Surveillance, in terms of surgical site infection, refers to the systematic collection, analysis, interpretation and feedback of data relating to surgical wounds.

2.8.1 International surveillance

Internationally there appears to be a wide variety of surveillance techniques used to report the incidence of surgical site infection. A selection of international papers reporting the incidences of surgical site infection, using surveillance techniques are presented in Table 2. 7 below:
<table>
<thead>
<tr>
<th>Country</th>
<th>Author(s)</th>
<th>Year</th>
<th>Study</th>
<th>Number of patients in surveillance</th>
<th>Type of surgery</th>
<th>Surveillance method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple countries</td>
<td>Leaper et al</td>
<td>2004</td>
<td>Systematic review</td>
<td>Varied</td>
<td>Varied</td>
<td>CDC definitions but surveillance varied between 1-30 days post surgery</td>
</tr>
<tr>
<td>France</td>
<td>Letrilliart, Guiguet, Hanslik and Flahault</td>
<td>2001</td>
<td>Prospective</td>
<td>7,540</td>
<td>General surgery</td>
<td>Utilising GP referrals for surgery and then re-referral due to infection within 30 days of surgery</td>
</tr>
<tr>
<td>Spain</td>
<td>Delgado-Rodriguez, Gómez-Ortega, Sillero-Arenas and Llorca</td>
<td>2001</td>
<td>Prospective</td>
<td>1,506</td>
<td>General surgery</td>
<td>Inpatient and 30 days post discharge by telephone and readmissions</td>
</tr>
<tr>
<td>Finland</td>
<td>Jämsen, Huotari, Huhtala, Nevalainen and Konttinen</td>
<td>2009</td>
<td>Retrospective</td>
<td>38,676</td>
<td>Total knee replacement, unicondular knee replacement and revision knee replacement</td>
<td>Using revision surgery as end point measurement one year post surgery</td>
</tr>
<tr>
<td>Australia</td>
<td>Cadwallader, Toohey, Linton, Dyson and Riley</td>
<td>2001</td>
<td>Prospective vs retrospective</td>
<td>510</td>
<td>Orthopaedic surgery</td>
<td>Comparing two different methods of surveillance-Infection control practitioner versus hospital coding system up to one year post discharge</td>
</tr>
<tr>
<td>Canada</td>
<td>Brandstadt, Armstrong and Henderson</td>
<td>2007</td>
<td>Prospective</td>
<td>1542 (inpatient) 272 (follow on care)</td>
<td>Cardiac, orthopaedic</td>
<td>Inpatient and those discharged into follow on care only for 30 days post surgery</td>
</tr>
<tr>
<td>Canada</td>
<td>Barnes et al</td>
<td>2006</td>
<td>Retrospective</td>
<td>23,105</td>
<td>Prosthetic hip joint replacement</td>
<td>Review of medical records for up to one year post surgery</td>
</tr>
<tr>
<td>Peru</td>
<td>Hernandez, Ramos, Seas, Henostroza and Gotuzzo</td>
<td>2005</td>
<td>Prospective</td>
<td>468</td>
<td>Abdominal surgery</td>
<td>Inpatient to 30 days post surgery</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Fan, Hung and Fung</td>
<td>2008</td>
<td>Retrospective</td>
<td>353 Patients</td>
<td>Total knee replacement</td>
<td>Using medical records post discharge mean follow up was 46 months (range 1-107 months)</td>
</tr>
</tbody>
</table>
What is evident from Table 2.7 is that a wide variety of methods have been used to report the incidence of surgical site infection across the world. As a result of the wide variety of methods used to report surgical site infection, difficulties arise when trying to making comparisons between different rates of infection involving different countries.

2.8.2 National Surveillance

In 1986 the United Kingdom National Nosocomial Infection Surveillance Service (NNISS) was developed. This was designed to give a simple, but valid, method of comparing infection rates between surgeons and hospitals (Friedman, Bull, Russo, Gurrin & Richards, 2007). This was followed in 1999 by the White Paper, Saving Lives: Our Healthier Nation, in which the Government made a pledge to reduce the incidence of infectious diseases, including the incidence of hospital acquired infection (DOH, 1999). Subsequent to this, in 2000, the then Health Minister made a recommendation that all NHS Trusts in England be required to monitor the levels of hospital acquired infections (DOH, 2003). At the same time, the Cunningham Report also identified surveillance systems as having a positive impact on surgical site infection reduction (Cunningham, 2000). As a result of this report, in 2002 the Healthcare Associated Infections Surveillance Steering Group (HAISSG) was set up to re-launch and redesign the NNISS as a service that was owned and run by the National Health Service (Hogg et al, 2005). The current trend for addressing healthcare acquired infections encourages the use of surveillance methods as a means of helping to reduce infections (Brandt et al, 2004). Feeding back clinically relevant information to healthcare care professionals regarding: the incidence of infection, the type of infection (superficial incisional, deep
incisional or organ/space) and the infecting organisms can allow for variations in outcomes to be evaluated.

This data are now collected as part of the mandatory surgical site surveillance and is used to evaluate the impact of current practice across the United Kingdom. The NSSISS uses an adjusted scoring system for identifying the risk of developing surgical site infection using three equally weighted pre-operative risk factors, comprising:

- American Society of Anaesthesiologists (ASA) score (developed by anaesthetists to determine the fitness of a patient undergoing surgery based on the current health status and number of co-morbidities)
- Length of surgery as a comparative ratio to how long that type of surgery normally takes
- Condition of the operative site prior to surgery (Kaye et al, 2001).

Surgical site infection surveillance became mandatory for orthopaedic surgery in England in April 2004 (Wilson, 2005). Data collected as part of the surveillance service recorded the incidence of surgical site infection identified during the in-patient stay, usually between 5-7 days post surgery. In 2008 the Health Protection Agency changed mandatory data collection practices on surgical site infection to include readmission for infection, related to the surgical procedure, where readmission occurred within 30 days. They also added the optional, but not mandatory, reporting of post discharge surveillance and infections identified in the hospital outpatient setting occurring within 30 days of surgery (Health Protection Agency, 2008).
Reid et al (2002) suggest that by limiting surveillance to include only five days post surgery (the usual length of stay) a 4.5% infection rate was identified. However, including post discharge surveillance resulted in a further 8.1% infections being identified, bringing the total number of infections identified to 12.6%. This meant that over half of the wound infections identified in their study would have been missed from the data. A finding supported by Prospero et al whose study found that 60.2% of all surgical site infections identified had developed post discharge, although they do not specify exactly how many days post surgery the infection was identified (Prospero et al, 2006).

Following the NSSISS protocols, data was collected through examining inpatient medical and nursing documentation. Patients’ wounds, identified as infected, are then compared to the nationally used criteria for defining surgical site infections, as outlined by the Health Protection Agency (HPA, 2008) (shown in Box 2.1). Infection control nurses collect, as part of the surveillance data, the results of any corresponding wound swabs or tissue specimens relating to the identified infection. Patients readmitted due to related surgical site infection, within 30 days of their original surgery, are also included within the surveillance data. This data are then submitted to a central office for collation. A formal yearly report is then sent to each individual hospital identifying individual infection rates and comparisons across trusts nationally. A full report, aggregating all reported surveillance, is also published for general review and can be accessed on the Health Protection Agency Website (http://www.hpa.org.uk)
2.9 Implications of surgical site infection

Having defined surgical site infection and discussed how such infection can be managed it is now important to turn to the implications of surgical site infection. The impact of wound infections following prosthetic implants has been recognised for many years as the most challenging complication post surgery in this patient group (Phillips, Crane, Noy, Elliott & Grimer 2006). Wound infections are associated with increased costs to healthcare providers and substantial attributable morbidity to patients, in terms of health related quality of life and physical and psychological functioning (Kaye, Sloane, Sexton & Schmader, 2006; Woodfield, Beshay, Pettigrew, Plank & van Rij, 2007). Each of these factors (financial, physical and psychological) will be discussed in greater detail below.

2.9.1 Personal financial impact

As previously presented in section 2.1, the age at which joint replacement surgery is currently being undertaken continues to include younger age groups, and as the retirement age for both males and females rises, a significant number undergoing this type of surgery may still be in employment. Although currently there are no figures available regarding the number of people employed receiving joint replacement surgery. Patients undergoing joint replacement, as part of their expected recovery, usually require up to three months before being able to return to work. When it then becomes necessary to extend time away from work, due to complications following the development of a post-surgical infection, the financial impact to individuals and their families could be significant (Brandstadt, Armstrong & Henderson, 2007; Whitehouse, Friedman, Kirkland, Richardson & Sexton, 2002).
2.9.2 Organisational financial impact

The financial implications to healthcare organisations of surgical site infections are enormous. The cost of surgical site infection in the United Kingdom in 2006, based on national surveillance data, has been estimated to be £61 million per annum (Reilly et al, 2006). This £61 million incorporates both the costs related to the extensive treatment required (which covers potentially re-operation, extra nursing care and relevant drug therapies) and additional bed days utilised through extended length of stay. Prosthetic joint infection is considered an economic burden on healthcare resources (Sia et al, 2005) both nationally and internationally. The health economic burden of surgical site infection is not only restricted to hospital inpatient episode (van Kasteren et al, 2007), as infections are also diagnosed post discharge. This is a point reflected in the recent surgical site surveillance data which showed that, of the total number of surgical site infections identified, 49% of knee and 58.3 % of hip infections were identified through the patient’s readmission to hospital (Health Protection Agency, 2010). International studies by both Whitehouse et al (2002) and Shama et al, (2009) suggest that surgical site infection, following orthopaedic surgery, doubles the incidence of readmission (thereby increasing hospital bed days per patient) and triples the cost of the original procedure. Currently no equivalent breakdown of figures could be found relating to orthopaedic infection rates in the United Kingdom.

2.9.3 Physical impact

The drive to reduce costs and financial burdens on healthcare providers, in relation to surgical site infection, is at the forefront of healthcare debates. However, surgical site infection also negatively impacts on the quality of life of
the individual patient. Quality of life is a term used frequently within healthcare literature when comparing the effectiveness or impact of treatment options on disease specific groups (DeGeest and Moons, 2000). The concepts represented by the term ‘quality of life’ are multidimensional, and, at a minimum the dimensions commonly agreed to constitute quality of life are physical, social and mental well-being (DeGeest and Moons, 2000). Whilst a variety of papers report the outcome of quality of life studies in relation to joint replacement surgery they do this with an emphasis on functional outcome (Suda, Seeger, Bitsch, Krueger & Clarius, 2010; March et al 1999; Rolfson et al, 2011).

The physical impact on the individual who develops a surgical site infection (following total hip or total knee replacement surgery) include: loss of function (mobility), pain and the potential need for re-operation. Cahill et al’s investigation, although focused on the quality of life for patients after infection in total joint replacement, identified significant increases in pain ($p=0.001$), stiffness ($p\leq 0.005$) and reduced function ($p\leq 0.0005$) when using the WOMAC arthritis index (Cahill, Shadbolt, Scarvell & Smith, 2008). Their study showed that the physical impact of surgical site infection is integral to the quality of life index.

The physical impact of infection is further exemplified by the work of Whitehouse et al. (2002), who showed that the greatest impact (in relation to quality of life scores of patients with post-operative infections) related to the physical functioning domains of the score. They suggest that patients with orthopaedic surgical site infections have substantially greater physical limitations and significant reductions in their health related quality of life (Whitehouse et al, 2002). The need for long term intra-venous antibiotic therapy
and immobilisation of the implant to treat a prosthetic joint infection can also contribute to the reduction in the individual’s functional ability (Bryne, Morris, McCarthy, Quinlan & O’Byrne, 2007). Deep infection can affect the condition of the soft tissue and the bone, and therefore can impact on the integrity of these structures, resulting in reduced support to surrounding structures which could result in reduced mobility (Zalavras, Patzakis, Holtom & Sherman, 2005).

Immediate pain can be associated with the procedure itself, but extended pain can also be associated with the development of surgical site infection causing further pain due to inflammation, swelling and tissue damage. When the treatment, with antibiotic therapy is unsuccessful (because the organism has not responded or specific organisms were not identified and generic antibiotic therapy was used) further surgery may then become necessary. In extreme cases, prosthetic joint infection can be the ‘dreaded complication’ that can result not only in pain and revision surgery, but if unresolved, can result in the failure and removal of prosthesis or, in extreme cases, loss of limb, (Sia et al. 2005; Ridgeway et al, 2005). For some individuals both the financial and physical impact of infection following joint replacement surgery can also cause additional worry and emotional strain.

2.9.4 Psychological impact

Surgical patients are in a unique position where physical assault to the body occurs in order to receive treatment (Gammon, 1998). This “physical assault” can reveal feelings of vulnerability and reduce ‘normal’ coping strategies, especially when a surgical site infection develops post-operatively. Bennett-Guerreno (2008) when discussing the risk factors and prevention of post-
operative surgical site infection uses the term ‘significant suffering’ when discussing the implications of surgical site infection. Review of the literature, identifies some of the emotional and psychological implications that infection can have on individuals experiencing a joint replacement infection (Cahill et al, 2008; Donaldson, Jalaludin & Chan, 2007). However what appears to be missing from this literature is the patient’s voice. Studies based on functional outcome and quality of life scores based on pre-set measurements lack the personal insight, or the ‘voice’ of the individuals’ experience of surgical site infection.

The emotional issues associated with the development of a surgical site infection and the impact this has on quality of life have not been fully explored within the published literature. Areas such as psychological well-being that are explored as part of assessment tools (such as the Nottingham Health Profile) can tell us according to the scoring system whether the patient is experiencing emotions and feelings that may be associated with depression. However these general assessment tools, used throughout the healthcare arena, (i.e. not specific for surgical site infection) using predetermined questions may not tell us about the individual’s treatment and management journey or its impact told in the patient’s words.

Qualitative studies, some using phenomenological approaches, have explored the experience of ‘infection’ and present the anxiety and depression that can be associated with the development of infection (Madeo, 2001; Knowles, 1993; Newton, Constable and Senior, 2001). These findings reveal the patient experience as one of isolation (Barratt, Shaban & Moyle, 2011). However much
of this work relates to generic infections rather than surgical site infection, and addresses the patient experience of being separated or “isolated”. If, for example, a patient is infected with Methicillin resistant *Staphylococcus aureus* (MRSA) then the normal practice (within most hospitals) would be to isolate the patient in a single room. For some, this enforced isolation can precipitate anxiety or depression. The literature would suggest that the emotional aspect of acquiring this type of infection is not always recognised by healthcare professionals (Hamour, O'Bichere, Peters & McDonald, 2003). In contrast to patients infected with MRSA, most patients being treated for surgical site infection, and in particular a joint replacement infection, will not necessarily be isolated (Nevertheless they may experience similar episodes of anxiety, vulnerability and depression). In addition, surgical site infection patients are sometimes treated post discharge initially within primary care. Thus they may be in their own homes rather than the hospital setting, and, as such, their experiences are likely to be very different to those who are being treated in hospital.

From the above brief overview of the literature it can be seen that the ability to understand what the patient experiences, (as a result of developing a surgical site infection post joint replacement), needs further studies that explore both the physical and psychological aspects of the impact of infection from the patient’s perspective. There are a number of methodological approaches that can be utilised. A recognised method of describing the patients’ experience is through the use of qualitative research adopting a descriptive phenomenology approach. Phenomenology is designed to access the meaning of phenomena by exploring the experience of those who have been subjected to it. Madeo
used a phenomenological approach in his study exploring perceptions and experiences of developing an MRSA infection because the phenomenological approach values the subjectivity of the experience (Madeo, 2001). Phenomenology was, therefore, considered to be a suitable qualitative approach to explore the psycho-social question: What are the perceptions and experiences of patients who develop a surgical site infection following either total hip or total knee replacement surgery.

2.10 Rationale for study

As a result of this review several gaps in the literature have been identified, which will be addressed using a mixed methods approach.

2.10.1 Rationale for Phase One: six weeks post-surgery surgical site surveillance

Firstly there are deficiencies identified with current surveillance methods which do not report post discharge surgical site infection treated in the outpatient setting. Currently mandatory data on those patients readmitted within 30 days of infection are collected and individual healthcare trusts can decide whether to collect post discharge surveillance data. The National Surgical Site Infection Surveillance Service outlines the protocols for the surveillance of surgical site infection nationally (Health Protection Agency, 2008). The addition to the surveillance protocol (to include the optional collection of post discharge surveillance data) arose from the Health Protection Agency acknowledgement that with reducing length of stays across the country the true incidence of surgical site infection was not being recorded when data relating to inpatient and patients readmitted within 30 days for infection is used. Finally, mandatory
surveillance is only required for one quarter period per year (three months), data submission for the other three quarters is optional (Health Protection Agency, 2008). It is important to consider that this data may only reflect a three month period in any one calendar year. Such data could be misleading especially considering potential changes in practice and evidence based guidelines are based upon the results of these surveillance methods.

What is evident from the literature reviewed is that current surveillance methods utilised may underestimate the current rate of surgical site infection developing within 30 days of the operative procedure. Letrilliart et al (2001) suggest that although surveillance is improving to incorporate post discharge surveillance, this is mainly evident only in the United States, where they use automated screening of electronic health records. Restricting the surveillance of surgical site infections to inpatient stay alone may generate data which presents an underestimation of the rates of infection as presented earlier studies by both Reid et al, (2002) and Prospero et al, (2006).

As mentioned current surveillance methods only incorporate infections that develop during the inpatient stay, if lengths of stay continue to reduce, with earlier return to the community setting, the number of surgical site infections captured in the current surveillance systems may project a falsely low infection rate. The NHS Institute for Innovation and Improvement has also launched the enhanced recovery programme aimed at improving patient outcomes and speeding up their recovery (NHS Institute for Innovation and Improvement, 2012), and as such present the potential for further reduction in post-operative length of stay, with further impact on reliability of surveillance data.
An advantage that the Surgical Site Infection Surveillance Service has is that it uses a standardised data collection process and criteria for defining infection. This means that useful comparisons can be made year to year regarding trends in surgical site infection data. As such using a standardised surveillance method, using recognised definitions of surgical site infection should enhance the reliability and validity of data collected.

Hospital associated infections are considered one of the most serious patient safety issues in healthcare (Kleinpell, Munro & Giuliano, 2008). However in order to make the most effective use of the results of surveillance undertaken, surveillance needs to supply clinically relevant information regarding the whole 30 day period post surgery and current treatment regimes.

This study intends to address some of the criticisms presented relating to current surveillance methods. These criticisms relate specifically to the lack of comprehensive surveillance data that incorporates the whole 30 day period. Included within this surveillance are patients whose infections develop post discharge and not readmitted. The question Phase One of this study aims to address is: what is the incidence of surgical site infection, including those infections that develop post discharge and not readmitted to hospital? Through the use of a post discharge questionnaire sent out to patients six weeks post total hip or total knee replacement, data can be extended to include post discharge information. The additional data this questionnaire will collect relates to:

- the time infection developed post surgery
- the description of the wound,
- the collection of surgical site specimens
- the use of antibiotics
- the incidence of readmission because of infection

2.10.2 Rationale for Phase Two – exploration of the lived experience of having a self-reported surgical site infection

Secondly, this review of the literature has indicated a gap in the literature relating to the patient’s journey following development of surgical site infection. Whilst surveillance is a useful system to identify how many infections have developed and what type of infecting organism is present, it offers little in terms of understanding the lived experience of developing an infection for the individual. The literature presented shows, that infection following joint replacement surgery, has a recognised physical and psychological impact on patients. The literature available mostly relates to patients infected and isolated as a result of developing MRSA, and does not necessarily reflect what patients with surgical site infection following joint replacement surgery experience. This gap identified in the literature highlights a need to explore what patients, who have had joint replacement surgery and developed a surgical site infection, experienced in terms of developing this infection and how their care was managed.

Phase Two of this study aims to address this identified gap in the literature through a qualitative methodology using a descriptive phenomenological approach to explore the lived experience of those who have developed a surgical site infection following either total hip or total knee replacement. It is
hoped that by exploring the patient journey and listening to the patient’s experience of having an infection, it will illuminate the experience for healthcare professionals from the patient’s perspective and provide greater understanding of their experience.

2.11 Research Design

The previous sections have reviewed the literature surrounding infection following total hip or total knee replacement. Two gaps in the current literature were identified, the first one was the absence of post discharge surgical site infection surveillance reporting and secondly the lack of published data exploring the experiences of those who have developed an infection.

The first issue, that of incidence of post discharge surgical site infection may best be answered using quantitative methods, such as survey techniques to identify the number of infections that have developed over the specified time period. The second issue, that of exploring individual’s experience of developing surgical site infection may best be answered using qualitative techniques. In order to address these two research questions a decision was made to utilise a mixed method approach to conduct this study incorporating both quantitative and qualitative techniques.

In order to achieve the goals of the research study the issues of research philosophy and research paradigm need to be considered. A discussion follows supporting the methodological choice and research design process of this study.
2.11.1 Research philosophy

Research philosophy relates specifically to the way in which individuals think about knowledge development (Saunders, Lewis and Thornhill, 2003) and as such there is a need to consider the ontological (nature and reality of being) and epistemological (study of knowledge) stance of the research being undertaken. Table 2.8 outlines the ontological and epistemological stance from both the objective and subjective view as presented by Crotty (1998).

### Table 2.8: Ontological and epistemological stance in relation to research philosophy as presented by Crotty (1998)

<table>
<thead>
<tr>
<th></th>
<th>Objective</th>
<th>Subjective</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ontology</strong></td>
<td>Reality exists in hard tangible structures</td>
<td>Reality is a product of individual’s consciousness</td>
</tr>
<tr>
<td><strong>Epistemology</strong></td>
<td>Knowledge exists independent of consciousness</td>
<td>Knowledge is imposed on the object by the subject.</td>
</tr>
</tbody>
</table>

The issues in research stem from the debate between whether reality exists in hard, tangible structures (objective) or as a product of an individual’s consciousness (subjective) (Crotty, 1998). Morgan and Smircich (1980) believe that presenting a simple dichotomy between objective and subjective ontology and epistemology is too limiting, oversimplifies the issues and as such runs the risk of creating an abstracted empiricism, whether it is quantitative or qualitative in methodology. As such Morgan and Smircich (1980) present the objective-subjective divide more subtly on a continuum, which suggests that there are potentially six different assumptions about the nature of knowledge. This continuum includes reality as a projection of imagination, as a social construction, as a realm of symbolic discourse, or as a contextual field of information, or as a concrete process and finally, as a concrete structure. Whilst epistemology is concerned with the study of knowledge and what can be
accepted as valid knowledge (Collis and Hussey, 2003). Morgan and Smircich (1980) suggest that knowledge can be gained by understanding the roles of human beings in social reality. However the stance taken with regard to knowledge development, whether it is objective or subjective, depends on the assumptions the researcher has about how individuals interact within their own ‘world’, and the methods individual researchers use to explore these interactions. These assumptions, regarding the nature of knowledge and the way in which knowledge is gained are then used to form the underpinning foundations for the research method required. For the purposes of this research project a subjective ontological and epistemological viewpoint was taken; with a personal belief that ontologically people assign meaning and interpretation to their experiences and epistemologically, knowledge is socially constructed and as such is relative to the ‘knower’.

### 2.11.2 Research paradigms

Ontological and epistemological views can be related to the research paradigms when applied to social and behavioural research (Creswell and Tashakkori, 2007) namely; positivism, constructivism, post-positivism and pragmatism (Tashakkori and Teddlie, 1998).

Those research paradigms that incorporate only quantitative methodology fit within the positivism paradigm and exclusively qualitative methodology fit within constructivism. Whereas research that is primarily, but not exclusively quantitative fits within a post-positivism paradigm. Finally, when a mixture of both quantitative and qualitative is adopted this research is considered to fall with a pragmatic research paradigm. The distinction between the differing
paradigms relates to whether deductive logic (positivism), inductive logic (constructivism) or a bringing together of the two (pragmatic) occurs (Tashakkori and Teddlie, 1998). However, the use of mixed methods research in practice has raised some interesting debates in the academic literature surrounding the dichotomy that exists between the paradigms. Hammersley (1992) argues against the dichotomy between the paradigms, suggesting in fact, that the diversity of social science research cannot be confined within predetermined paradigms; Johstone (2004) also suggests it is a false dichotomy upheld by some quantitative and qualitative researchers. Both Hamersley (1992) and Johstone (2004) argues against the dichotomy view and instead support the notion suggested by Morgan and Smircich (1980) that representation of the subjective-objective divide should adopt the most appropriate method to explore the questions currently being asked by researchers. Currently mixed methods research is a growing and emerging field and there appears to be a move that encompasses mixing the different research approaches as a means to address wide ranging research questions. More importantly, it is in fact incumbent on the researcher to make efficient use of both approaches, where deemed appropriate, in relation to the research question(s) being posed.

The use of mixed method research is increasing (Bryman, 2006), and as it becomes more popular it is being recognised as a ‘stand alone’ method (Hanson, Creswell, Plano Clark, Petska and Creswell, 2005). Debate has raged for more than a century between the advocates of quantitative and qualitative research, with Johnson and Onwegbuzie (2004) suggesting that purists from each side have emerged advocating their method as the ‘ideal’ and that from
the purists perspective research methods should not be mixed. However as identified in section 2.11.2 the epistemological and ontological stance taken when formulating a research question does not always sit conveniently in either a qualitative or quantitative methodological approach and that it may be necessary to combine these approaches. This mixed method approach to research involves the use of both quantitative and qualitative methodology either in a single study or part of a series of studies that explore the same phenomenon (Onwuegbuzie and Leech, 2006). It was therefore deemed important that in order to achieve the aims of this proposed study, a combination of both qualitative and quantitative approaches was required, and as such falls with the pragmatic paradigm further discussed below.

2.11.3 Mixed Methods

The way in which research methods can be mixed is largely dependant on the perspective taken at the planning stage of the research process. Table 2.9 presents an overview of the four main perspectives of mixed method research as presented by Creswell and Tashakkori (2007) and Creswell and Garrett (2008).
### Table 2.9: The four perspectives of mixed method research as presented by Creswell and Tashakkori (2007) and Creswell and Garrett (2008)

<table>
<thead>
<tr>
<th>Perspective</th>
<th>Explanation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paradigm perspective</td>
<td>presented as an overarching worldview that provides a philosophical foundation</td>
<td>Emphasis is on philosophical issues relating to knowledge generation, and the nature of reality</td>
</tr>
<tr>
<td>Method perspective</td>
<td>Focused on process and outcome</td>
<td>Data collection and analysis might be centred on two separate or related research questions within one study that call for both quantitative and qualitative data</td>
</tr>
<tr>
<td>Methodological perspective</td>
<td>Where the different methods cannot be separated from the overarching process</td>
<td>Philosophical assumptions, data collection and analysis are considered as one with the research process</td>
</tr>
<tr>
<td>Practice perspective</td>
<td>In which mixed methods are viewed as a set of procedures used to conduct research</td>
<td>The need for mixed method strategies emerges during the research processes such as mixed method procedures used in meta-analysis</td>
</tr>
</tbody>
</table>

Creswell and Garrett (2008) suggest that, as with the early developmental stages of any new methodologies, confusion and debate often accompanies the early presentation of novel ideas and concepts. However, what has emerged is that there are differing perspectives within the field of mixed methods research. Table 2.9 identifies the overarching perspectives and helps delineate between research that focuses on methods (method perspective), the process of research (methodological perspective), the philosophical issues (paradigm perspective) and those who use existing research designs as a foundation from which to build new methods (practice perspective).

The combination of collecting both quantitative and qualitative data, as presented within this thesis, suggest that this study falls within a methods perspective, where the focus remains on utilising the individual research methods for the differing types of data to be collected. As such the methods
themselves are not mixed and so there is no ‘blending’ between the differing paradigms (Creswell and Tashakkori, 2007).

Having considered the research perspective, in terms of mixed method, the next focus remains on defining the research design. Table 2.10 presents the six main mixed method designs outlined by Creswell and Plano Clark (2011).

Table 2.10: The six main mixed method designs presented by Creswell and Plano Clark (2011)

<table>
<thead>
<tr>
<th>Research Design</th>
<th>Definition</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convergent</td>
<td>Concurrent quantitative and qualitative data collection with separate analysis merging the two sets of findings</td>
<td>Provides a complete understanding of topic or to validate quantitative studies</td>
</tr>
<tr>
<td>Explanatory</td>
<td>Methods implemented sequentially, quantitative followed by qualitative</td>
<td>Need to explore quantitative results</td>
</tr>
<tr>
<td>Exploratory</td>
<td>Methods implemented sequentially, qualitative followed by quantitative</td>
<td>Need to test or measure qualitative results</td>
</tr>
<tr>
<td>Embedded</td>
<td>Either concurrent or sequential data collection with separate data analysis with the use of supporting data before, during or after data collection</td>
<td>Need for preliminary explanation or more comprehensive understanding before an experimental trial</td>
</tr>
<tr>
<td>Transformative</td>
<td>Framing concurrent or sequential data collection and analysis within a theoretical transformative process</td>
<td>Research that identifies and challenges social injustices</td>
</tr>
<tr>
<td>Multiphase</td>
<td>Combines either concurrent or sequential data from both qualitative and quantitative studies conducted over multiple phases</td>
<td>Program development and evaluative studies</td>
</tr>
</tbody>
</table>

Table 2.10 outlines the six main mixed method designs that arise depending on how the conduct of the research will be carried out. This can be planned in advance (where the research design is fixed) or emerge as a result of the need to further explore the results obtained in previous research (emergent). For this study a fixed explanatory design was adopted in which the qualitative aspect
was used after the quantitative phase to further explore the experiences of those who had been identified as having developed a surgical site infection.

In summary, the research design arose from two identified gaps in the current literature surrounding surgical site infection in joint replacements; firstly, the absence of post-discharge surgical site infection surveillance reporting at six weeks post surgery, and secondly, the lack of published data exploring the experiences of those who have developed an infection. A pragmatic approach (using a mixed method design) appeared to meet the needs of addressing two differing research questions on a related topic, within the one study. The approach chosen was that of a mixed method study that fell within the method perspective, where the research followed an explanatory design; qualitative approach (exploration of the lived experience) was chosen to explore and expand upon the initial results of the first phase of the study, after utilising a quantitative approach aimed at identifying the incidence and management of those self-reporting surgical site infections following total hip or total knee replacement.

The next chapter will present Phase One of the study; development and administration and analysis of the results of a post-discharge surveillance questionnaire.
CHAPTER 3 : QUANTITATIVE METHODOLOGY
PHASE ONE  POST DISCHARGE SURVEILLANCE QUESTIONNAIRE

3.1 Introduction

Chapter Three presents Phase One of the study. Phase One incorporates the development and subsequent distribution of a post discharge surgical site infection surveillance questionnaire. The data collected relates to self-reported surgical site infection and included information relating to: the time to infection development, how the infection presented and was subsequently managed. Sampling, recruitment and data analysis methods will be presented. The results obtained will be presented followed by discussion of the results in context with the data collected from the Nosocomial Surgical Site Infection Service.

3.1.1 Aims and objectives

The aim of Phase One was to identify patient reported surgical site infection within six weeks following either total hip or total knee replacement surgery. To achieve this aim the objectives can be summarised as:

1. To develop and pilot a data collection tool to collect the details of patients who self report developing a post discharge surgical site infection.

2. To distribute a post discharge surveillance questionnaire to identify, by means of a cross sectional survey design, how many patients (within the chosen District General Hospital, over a one year period) self-report a surgical site infection within six weeks following a total hip or total knee replacement.

3. To explore the criteria patients use to identify an infection.
4. To explore which healthcare resources were used when patients identified a possible surgical site infection.

5. To identify how many infections were identified post-surgery where patients were not readmitted to hospital with an infection.

3.1.2 Ethics

Ethical approval was sought from the NHS National Research Ethics Service, through The Isle of Wight, Portsmouth & South East Hampshire Research Ethics Committee. A full written application with supporting information sheets, draft questionnaires and consent forms were submitted to the committee. Both the researcher and academic supervisor attended the committee meeting on 19th June 2009. There were a number of questions related to the study from committee members. One member of the panel wanted to confirm, that based on the predicted infection rates, that this study would generate enough potential cases for inclusion in Phase Two of this study. Figures presented regarding published infection rates in joint replacement (presented in Chapter 2 section 2.6) showed inpatient infection rates of 1.6%-2.6% rising to 12.4% and an argument was presented that surveillance incorporating the 30 day post discharge period would result in higher rates of infection being reported. This argument was supported by studies that evaluated surgical site infection using inpatient and readmission data showing that 41% of surgical site infections identified were done so through data collected on readmission to hospital (Health Protection Agency, 2010, p.6). Using a midway point between 1.6-12.4% suggested that a 6.2% infection rate could potentially be anticipated. This figure (of 6.2%) was then used to predict, out of the 523 total hip and total knee replacements undertaken in the previous year, the number of potential
infections to identify how many patients might be available for inclusion in Phase Two of this study. Using these figures it was identified that 32 patients could potentially be available for inclusion. The committee were satisfied with these figures.

A formal letter was received on the 1st July 2009, (Appendix 1) indicating a favourable opinion subject to requests for the changes specified below being met:

1. To remove the term ‘burden’ from the title of the study presented in the introductory letter that accompanied the questionnaire. The Ethics committee felt the use of the word ‘burden’ would be too emotive in this context.

2. Increasing the font size in the Patient Information Sheet

3. Clarify, in the questionnaire, that if the answer to question 2 was "No" (No infection identified) there was no need to continue through the rest of the questionnaire

4. Clarify, for the reader, that the questionnaire should be completed at six weeks post surgery

5. Redesign part of the questionnaire to identify the specific reason for participants visiting their General Practitioner

The revisions were submitted to the committee and a favourable opinion given on the 8th August 2009, subject to local research governance approval for the study to commence was obtained (Appendix 2).
With regard to Phase One no formal consent process was required by the NHS ethics committee prior to completion of the questionnaire. However each patient was sent an introductory letter with the questionnaire explaining the purpose of the research and what was involved in taking part. Therefore, by default, patients were considered to have consented to participate if they returned a completed questionnaire. In order to ensure confidentiality/data protection The research proposal was put before the local data protection officers at the Trust and all data was stored on a password protected computer on a secure hospital network and data was backed up regularly on a password protected encrypted data memory stick that was stored in a locked filing cabinet within the hospital setting. Only I had access to the files stored.

3.1.3 Research governance
Following favourable opinion from the Isle of Wight, Portsmouth & East Hampshire Research Ethics Committee, approval from the hospital research committee was sought. There was one significant issue over sponsorship of the study raised by the local Governance and Assurance Department. The issue was whether the role of sponsor fell to the University or the employing organisation. Due to time constraints with returning completed documentation to the Isle of Wight, Portsmouth & East Hampshire Research Ethics Committee, the employing organisation’s local Governance and Assurance Department agreed that on this single occasion they would accept the responsibility of sponsor (Appendix 3).
3.2 Phase One - Research Method

Cross sectional studies utilise research methods that involve observations of a whole population at a specific time point and surveys are one methodology that can be used to collect data within such a research design. The aim of the study was to obtain descriptive data relating to the incidence (the number of new cases of infection identified) of self reported surgical site infection and the clinical features presenting alongside these infections.

Surveys can be undertaken using a variety of different data collection methods depending on the type of data to be gathered and the resources available.

More specifically examples of different survey methods include:

- Telephone surveys
- Postal questionnaires
- Face to face administration
- Web based (Tangue, 2004)

Phase One of this study utilised a cross-sectional postal survey design as the method of collecting data after careful consideration of the different survey methods available.

Studies looking at post discharge surgical site infection using telephone follow up include those by Delado-Rodriguez et al (2001). Their study, whilst using telephone follow up to identify if patients reported a surgical site infection, excluded those that had not been seen by a physician to confirm an infection was present. Excluding the unconfirmed infections resulted in 29 of the reported infections being discounted from their study (because they had not been confirmed by a physician). This resulted in a lower number of infections, 45.6% identified post discharge from the total number of infections identified. This was
substantially lower than the 71% detected by studies such as Reimer, Gleed and Nicolle (1987) who used telephone surveillance solely and did not rely on the results being confirmed by a physician.

The use of face to face surveys, in relation to surgical site infection, however is not presented within the explored literature. This may be due to the fact that surveillance undertaken in terms of ‘face to face’ contact usually occurs in an outpatient setting and involves a clinical consultation. As such the diagnosis of infection is based on what clinicians can see when examining the patient and not on the results of questionnaires completed during the consultation.

The use of web based surveys, for collecting surgical site surveillance data has not been presented in the current literature. There is evidence from research presented in recent advertisements by the British Broadcasting Corporation suggesting computer literacy is low, which suggests this would not necessarily currently be a good surveillance method.

Other surveillance methods, not mentioned by Tangue (2004), but presented in surgical site surveillance literature relate to the use of private health plan data. This records when a surgical site infection is reported on a patient and is based on resource use and billing information. Sands et al, (2003) compared two different methods of surgical site surveillance, one utilising a private health care plan claim system and the other a standard surgical site surveillance similar to NSSISS. Results indicated that utilising healthcare claims, as a means of identifying surgical site infection, resulted in identifying 50% more surgical site infections than compared to routine surveillance. This was because private
healthcare plan claim systems recorded the additional use of resources required by individuals and the reasons these extra resources were required. Inclusion of additional healthcare resources used, as a means of identifying the incidence of surgical site infection, can enhance the quality and accuracy of surveillance data.

The use of post discharge postal questionnaires has been presented in several studies. Petherick, Dalton and Cullum (2008) cite (Blitzer, 2000, and Sjol, 2002) who used postal questionnaires solely, both of these showing high response rates of 73% and 82.7% respectively. Studies that have specifically used post discharge postal questionnaires (to undertake surgical site infection surveillance in joint replacement patients) report response rates of 85.2% (Huenger et al., 2005) and 71.2% (Whitby et al., 2002) respectively, indicating this as an effective method for collecting self-reported surgical site infection data post discharge. Bowling (2005), when evaluating the modes of questionnaire administration in relation to return rates, have shown that postal questionnaires achieve a higher response rate than those administered by hand, advocating this as an appropriate means of data collection.

What was also evident from Petherick, Dalton and Cullum’s 2008 review was that the majority of studies identified, whether collecting data by telephone or postal questionnaire, asked questions relating to temperature, wound discharge, antibiotic use and visits to healthcare professionals (Delado-Rodriguez et al, 2001; de Oliveria and Carvalho, 2007) similar to the criteria used to identify surgical site infection reported to the NSSISS.
In summary Petherick et al, recommend that the most reliable way of collecting post discharge surveillance would be through telephone interviews. However they recognised that this resource intensive method would not necessarily be acceptable, because of cost implications, within current healthcare provision. Locally telephone follow-up had been trialled for surgical site infection surveillance, but had to be stopped as patients complained that they found these telephone calls intrusive. Petherick et al, (2008) suggest that the use of patient completed questionnaires is the next best alternative.

When patient completed questionnaires are used the issue around accuracy of reporting surgical site infection arises. Gaine, Ramamohan, Hussein, Hullin and McCreath (2000) suggest that difficulties exist for clinicians in identifying the difference between inflammation and infection of a post-surgical wound. Studies that have explored the accuracy of patient reported surgical site infection include Mitchell, Swift and Gilbert’s (1999) study which evaluated 680 cases were surgeons and patients had completed post discharge surgical site infection surveillance. They identified that there was substantial agreement between the two groups in relation to the correct diagnosis of infection. In spite of this the Surgical Site Infection Surveillance Service analyse patient reported surgical site infection data separately from the mandatory collected NSSISS data as they state it is not possible to confirm infection or the type of surgical site infection reported (Health Protection Agency, 2008).

3.2.1 Questionnaires

Postal questionnaires were chosen as the most appropriate method to collect this information. The reason for this is the time frame identified as representing
a surgical site infection is those infections that develop within 30 days post surgery. At 30 days post surgery most patients have been discharged from hospital. An appropriately designed questionnaire, where questions are presented using words and terminology that patients can easily understand, provides an appropriate data collection tool for the purpose of post discharge surveillance.

3.2.2 Development of questionnaire

The questionnaire used within this study was developed with questions using the same terminology used in the criteria for identifying surgical site infection (Health Protection Agency, 2008). The criteria developed by the Centre for Disease Control outlines the features considered relevant in the diagnosis of surgical site infection (Horan et al, 1992). It was decided that collecting data in the post discharge phase using the same criteria as that used to determine infections during the inpatient stay would provide for direct comparison between in-patient and post discharge surveillance data.

When developing the questionnaire for use in this study consideration was given to: questionnaire design and layout, achieving good response rates, question phrasing and the necessity to pilot the questionnaire before using it in the study.

3.2.2.1 Response rates

Edwards et al, (2002) undertook a systematic review into ways of increasing response rates when using postal questionnaires. The length of question
(shorter ones producing more responses), the use of different coloured inks, personalised letters and the inclusion of a stamped addressed enveloped all improved response rates. Question formulation also has a profound effect on whether and how questions may be answered. (Rosen and Olsen, 2006). Oppenheim (1992) sets out some rules regarding the correct way to word questions to avoid many of the pitfalls associated with poorly constructed questionnaires. These rules include:

- Keeping questions short
- Avoiding double-barrelled questions
- Avoiding proverbs
- Avoiding double negative
- Giving the respondent the chance to say they do not know the answer to the question
- Using simple language (no abbreviations, ambiguity of terms)
- Being aware of potentially ‘leading’ questions and ‘loaded’ words
- Paying due attention to detail.

An example of a poorly worded question in relation to this study would be;

“Did you or did you not develop a wound infection following your recent surgery?”

1. Yes
2. No.

This question is poorly formulated as it breeches several of the rules presented above. Firstly the question contains both possible outcomes so answer yes or no would not tell the questioner whether they had an infection or not. Secondly the use of the term ‘recent surgery’ allows for ambiguity as individual patients
may have had addition/ alternative surgery from that being reviewed as part of the study. The principles outlined by Oppenheim (1992) were used in question phrasing and the rationale for questions used within the study presented are shown in section 3.2.2.3.

3.2.2.2 Questionnaire design and layout

Consideration was given to the layout of the developed questionnaire in order to minimise the burden to the patient completing it. Bowling suggests that questionnaires put a burden on the respondents, this burden is associated to the respondent’s ability to understand the question, recall the information requested and provide an adequate response (Bowling, 2005). As such the initial questions, within the questionnaire developed, were designed to assist navigation through the questionnaire, and act as a filter. If participants answered ‘no’ to this question, indicating they had not developed a surgical site infection, they did not need to proceed through the rest of the questionnaire.

With respect to visibility, questionnaires were printed on both white and yellow paper to identify which colour was felt to be more visually appealing to the reader. The consensus by colleagues and patient representatives was that yellow paper with black print was more conducive to completion, and that being yellow would also stand out from the plethora of ‘junk mail’ that members of the public can receive on a day to day basis.

3.2.2.3 Question Phrasing

The questionnaire was tested for readability using the Flesch reading ease score which evaluates the ease with which passages of text can be read. The
Flesch reading scores range from 0-100. A high score of between 90-100 is easily understood by those 11 years and under, scores between 60-70 are considered to be easily understood by 13-15 year olds, whilst scores between 0-30 are best understood by university graduates. Flesch reading ease score for the questionnaire came out as 59.9, indicating that it is suitable for a literate adult of average reading skills.

Table 3.1 presents an overview of question selection in terms of question type, the rationale for each question posed and types of information sought in relation to answering the specific aims of this study.
Table 3.1: Breakdown of questions included in postal questionnaire

<table>
<thead>
<tr>
<th>Question</th>
<th>Rationale for question</th>
<th>Type of Question</th>
<th>Information sought</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you remember how long you were in hospital following your operation?</td>
<td>To determine length of stay</td>
<td>Closed question</td>
<td>To compare whether those who felt they developed an infection had a longer length of stay and to compare length of stay with National Data.</td>
</tr>
<tr>
<td>In your opinion did you develop a surgical wound infection?(Not including the swelling and tenderness normally associated with a new surgical wound)</td>
<td>To illicit individuals’ views as to whether they felt they had developed a surgical site infection. A no answer would indicate questionnaire was now complete.</td>
<td>Closed Question</td>
<td>To determine the number of patients who felt they developed an infection. To compare this with National data available.</td>
</tr>
<tr>
<td>Do you remember at what stage following surgery the problem with your wound developed? Before Discharge…After Discharge……Days/Weeks/Months. (Please circle as appropriate)</td>
<td>To identify when problem developed post discharge</td>
<td>Open Question</td>
<td>To identify how many potential wound infections were evident before discharge and how many developed post discharge and what the average time frame was for those developing infections</td>
</tr>
<tr>
<td>Please identify, using the criteria below, how your wound problems presented. Was there any discharge or leakage of fluid from any part of the wound at any time?</td>
<td>Specific criteria outlined to collate with the centre for disease controlled recommended criteria for wound description</td>
<td>Open Question</td>
<td>To allow participants to put as many symptoms as they were experiencing, To be able to compare these to the Centre for Disease Control definitions of surgical site infection.</td>
</tr>
<tr>
<td>As far as you were aware, did any healthcare worker take a sample from your wound to send to the laboratory?</td>
<td>So that swab, tissue and fluid sample organisms could be identified and where possible confirm if infective organism present</td>
<td>Closed Question</td>
<td>This will allow a comprehensive view of current organisms grown and allow comparison with National data and also comparing organism to antibiotic use.</td>
</tr>
<tr>
<td>Have you been re-admitted to hospital with an infection of the surgical wound?</td>
<td>To identify readmission rates/ healthcare cost implications</td>
<td>Closed question</td>
<td>Important to determine readmission rates, especially where readmission did not occur to the unit in which the surgery was undertaken.</td>
</tr>
<tr>
<td>Please add any additional comments you may feel will be of interest to us relating to your wound infection</td>
<td>Giving individuals a voice to raise concerns not covered by questions</td>
<td>Open Question</td>
<td>To capture additional information the participant may feel relates to their experience.</td>
</tr>
<tr>
<td>If you developed a wound infection would you be willing to be contacted by letter, inviting you to participate in discussing your experiences in further detail by taking part in a personal interview? This could take place in your home or in the hospital at your convenience.</td>
<td>So that Patients could decide whether to take part in the interviews without further unnecessary contact from the researcher.</td>
<td>Closed question</td>
<td>Important to identify participants who would be willing to be contacted without them feeling unduly pressurised by formal contact.</td>
</tr>
</tbody>
</table>

*Complete questionnaire presented in Appendix 4
3.2.2.4 Questionnaire pilot and revision.

Piloting the draft questionnaire was necessary to ensure that the questions asked obtained an appropriate response and that the responses were fit for purpose. The questionnaire was first sent to a friend who was waiting for an operation (not part of the main study) for comments and feedback regarding layout, readability and comprehension. Feedback from the friend was positive. A suggestion was made to alter the wording in question six to advise responders that they could tick more than one box as part of their response; this would remove potential ambiguity associated with how to respond to this question.

The questionnaire was piloted amongst ten colleagues (to ensure that it would collect clinically relevant information) before sending it for inclusion in the ethical review process. The questionnaire was not piloted with current patients due to the time constraints associated with the study.

3.2.3 Sampling and Recruitment

The target population to receive the written questionnaire (shown in Appendix 4) comprised all patients (males and females) who had received a primary total hip or primary total knee replacement under the care of one of the five Orthopaedic Consultants working within this District General Hospital over a one year period.

3.2.3.1 Sample

The sample consisted of all those patients who were admitted and underwent primary hip or knee replacement surgery between 27th September 2009 and the 26th September 2010 (n=523). There was no need to undertake power
calculations as this was a cross-sectional study looking at the incidence of patient reported surgical site infection, in a specific case load of all patients, over a one year period to include a whole population sample. The time frame of a year was chosen for several reasons:

- Firstly, as it gave the opportunity to recruit a large enough sample account for potential seasonal variations in the number of operations performed
- Secondly, comparisons could be made between subsequent yearly data sets
- Thirdly, the annual number of surgeries performed was used as a predictor for the potential sample for Phase Two.

Table 3.2 identifies the total number of primary total hip and knee replacements undertaken over three consecutive years, within this district general hospital, indicating a consistent number of similar operations undertaken annually.

<table>
<thead>
<tr>
<th>Year period</th>
<th>Total Hip Replacement</th>
<th>Total Knee Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>232</td>
<td>281</td>
</tr>
<tr>
<td>2008</td>
<td>224</td>
<td>289</td>
</tr>
<tr>
<td>2009</td>
<td>251</td>
<td>272</td>
</tr>
</tbody>
</table>

3.2.3.2 Recruitment

Patients were identified for this project using the hospital’s Patient Administration System (PAS) using Office of Population, Census and Surveys Classification Codes-4th Revision (OPCS-4). These codes are used throughout
the National Health Service and translate operations and procedures into an alphanumeric code.

The Information Management Team sent details of patients identified as discharged (following primary total hip or knee replacement) through the Patient Administration System on a fortnightly basis. This data was then entered into a purpose built excel spreadsheet designed to identify the date (five weeks post surgery) at which to send the surveillance questionnaire (so that it could be completed at six weeks). At the time the questionnaire was sent, a second date, two weeks subsequent was identified on the spreadsheet. Questionnaires were sent with pre-paid reply envelopes and an introductory letter (Appendix 5). Once questionnaires were returned the data were entered in to the spreadsheet and the reminder date (set as two weeks, to resend questionnaires to those who had not responded) removed. Those patients whose questionnaires were not returned within this identified two week period received a single reminder questionnaire, together with a further copy of the covering introductory letter and prepaid reply envelope. A time period of two weeks was chosen before resending the questionnaire to non-responders as this allowed appropriate time for individuals to post replies (bearing in mind their reduced mobility status) and problems with both external and internal postal systems, but not so long as to excessively extend the surveillance period.

A flowchart outlining recruitment and data collection process is shown in Figure 3.1. If after sending the second questionnaire there was still no response it was considered that the individual had chosen not to participate and no further
reminders were sent. Shown in red in Figure 3.1 is the recruitment aspect of Phase Two of the study, as it interlinks with Phase One.

*Areas shown in red represent Phase 2 of this study*
3.2.4 Data coding

The patient demographics and operation details arrived from PAS in the form of an Excel spreadsheet. The next stage was to adapt the excel spreadsheet so that the results of the completed questions could be collated for analysis. This spreadsheet had been specifically created so that all the possible responses to questions were contained within drop down menus within the cells allowing for efficient data entry.

3.2.4.1 Data entry validation.

Data were entered as the questionnaires were returned. Ten percent of data entered were double checked by a colleague to give an indication of whether there were any discrepancies as data was being entered by a single individual. Data checking showed 100% comparability.

3.2.4.2 Data analysis

Data analyses were undertaken within the Excel spreadsheet using the Excel software formulas and pivot tables to generate data. The data analyses were designed to provide descriptive statistics, identifying the:

- Number of total hip and knee replacements undertaken within the specified time period
- Number of self-reported infections
- Time frames in which infection was identified post surgery
- Patient length of stay
- Characteristics of wounds as identified by patients
- Patients reported contact with healthcare professionals
3. 3 Results

This section presents the results obtained from the questionnaire on post-operative surgical site infection from patients who had undergone total hip or total knee replacement surgery.

3.3.1 Patients identified as having undergone total hip or knee surgery between 27/09/09 – 26/09/10

Table 3.3 outlines age and gender details of this specific group of patients with respect to total hip and knee surgery.

Table 3.3: Details of study patients identified as having undergone primary total hip and total knee replacement (n=523) between 27/09/09 – 26/09/10.

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Range (yrs)</th>
<th>Mean (yrs)</th>
<th>% of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>214</td>
<td>46-91</td>
<td>58</td>
<td>40.9</td>
</tr>
<tr>
<td>Total hip replacement</td>
<td>96</td>
<td>46-89</td>
<td>57.5</td>
<td></td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>118</td>
<td>57-91</td>
<td>65.5</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>309</td>
<td>34-95</td>
<td>62.5</td>
<td>59.1</td>
</tr>
<tr>
<td>Total hip replacement</td>
<td>155</td>
<td>34-95</td>
<td>62.5</td>
<td></td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>154</td>
<td>50-95</td>
<td>69.5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>523</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

However of the 523 patients identified only 505 were sent the questionnaire; Table 3.4 gives further details regarding patients, who though sent questionnaires, were not involved in the final analysis.
The questionnaire asked for post-operative information at six weeks following their recent surgery. The reasons that 18 patients were not sent the questionnaire (see Table 3.4) included:

1) Death within the six week post-operative period: n= 1
2) Details of patients from PAS arriving after the participants had passed the six week post-operative period (the period of the intended surveillance): n = 17.

Table 3.4: Details of identified study participants not included in final results of questionnaire analysis (n=76)

<table>
<thead>
<tr>
<th>Study participants not included in final questionnaire analysis:</th>
<th>Total Number</th>
<th>Percentage of total population (n=523)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>29</td>
<td>5.5%</td>
</tr>
<tr>
<td>Female</td>
<td>47</td>
<td>9.0%</td>
</tr>
<tr>
<td>Reasons for study participants not being included in final questionnaire analysis:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1) Death</td>
<td>1</td>
<td>0.2%</td>
</tr>
<tr>
<td>2) Patient details arrived after the six week post-operative period had past</td>
<td>17</td>
<td>3.25%</td>
</tr>
<tr>
<td>3) Incomplete questionnaire</td>
<td>3</td>
<td>0.6%</td>
</tr>
<tr>
<td>4) Non responder</td>
<td>55</td>
<td>10.5%</td>
</tr>
<tr>
<td>Total Exclusions</td>
<td>76</td>
<td>14.5%</td>
</tr>
<tr>
<td>Total completed questionnaires (Total study population - exclusions):</td>
<td>447</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.4 also shows the reasons why a further 58 participant’s questionnaires were not analysed. Initially there were 69 non respondents; however that number fell to 55 after a reminder was sent. Incomplete questionnaires resulted in a further three questionnaires being excluded from the final analysis. Therefore
the total number of patients who had initially been identified that went on to not being included in the final questionnaire analysis came to 76. Of these 76 patients, 29 were male and 47 were female. The total number of patient questionnaires whose data were included in the final analysis was 447, representing a response rate of 88.5%. Figure 3.2 shows participant flow through the study.
Primary total hip/knee replacement undertaken n=523

Exclusions
Patient details arrived after 6 week period n=17
Death n=1

Introductory letter + questionnaire sent n= 505

1st Questionnaire returned

Yes n=436
No n= 69

Reminder sent n= 69

Reminder questionnaire returned

Yes n=14
No n= 55

Total number of returned questionnaire included in the analysis n=447
(1st response 436- 3 incomplete questionnaires) 433+ (2nd response) 14 = 447)

Patient reported infection n=23
Patient reported no infection n=424

Total n=447

Figure 3.2 Participant flow through Phase One of the study
3.3.2 Study participants who self-reported a post-operative surgical site infection

Question two of the questionnaire asked patients to state whether they felt they had developed a surgical site infection. Figure 3.2 shows the number of patient questionnaires sent out and returned and the total number of patients self-reporting a surgical site infection. A breakdown of the details of study participants self-reporting a surgical site infection is presented in Table 3.5.

**Table 3.5: Details of Study participants reporting a surgical site infection**

<table>
<thead>
<tr>
<th>Details with respect to study participants who responded to questionnaire indicating that they felt they had experienced a surgical site infection (n=23)</th>
<th>Number (percentage)</th>
<th>Age Range (Yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>12 (52%)</td>
<td></td>
</tr>
<tr>
<td>Total Hip Replacement</td>
<td>3</td>
<td>71-80</td>
</tr>
<tr>
<td>Total Knee Replacement</td>
<td>9</td>
<td>60-87</td>
</tr>
<tr>
<td>Female</td>
<td>11 (48%)</td>
<td></td>
</tr>
<tr>
<td>Total Hip Replacement</td>
<td>4</td>
<td>52-73</td>
</tr>
<tr>
<td>Total Knee Replacement</td>
<td>7</td>
<td>50-85</td>
</tr>
<tr>
<td>Total</td>
<td>23 (100%)</td>
<td></td>
</tr>
<tr>
<td>% total questionnaires completed where patient indicated an infection</td>
<td>5.1%</td>
<td></td>
</tr>
</tbody>
</table>

Data analysis showed that 23 patients self-reported that they had developed a surgical site infection (see Table 3.5 and Figure 3.2). This represents a self-reported infection rate of 5.1% for those that were included in the questionnaire analysis (n= 447). Specifically for total hip replacements this equates to 3.3% of the total number of hip replacements, and 6.8% of the total number of knee replacement patients self-reporting surgical site infection.
3.3.3 Reported time frames of surgical site infections from study participants

As discussed, this study looked at the incidence of surgical site infection within a six week post-operative period. Table 3.6 shows the reported time frames for surgical site infections identified by the patient.

Table 3.6: Number of self-reported surgical site infections.

<table>
<thead>
<tr>
<th>Time interval following joint replacement surgery and identification of infection</th>
<th>Number of patients reporting surgical site infection within this time frame</th>
<th>Average length of stay-days (range in days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before discharge from hospital</td>
<td>10 (43%)</td>
<td>7.5 (3-14)</td>
</tr>
<tr>
<td>Total hip replacement</td>
<td>3</td>
<td>5.3 (5-6)</td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>7</td>
<td>8.4 (7-14)</td>
</tr>
<tr>
<td>0—13 days post discharge</td>
<td>7 (30%)</td>
<td>4.3 (3-6)</td>
</tr>
<tr>
<td>Total hip replacement</td>
<td>2</td>
<td>4.5 (3-6)</td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>5</td>
<td>4.2 (3-6)</td>
</tr>
<tr>
<td>2-4 weeks post discharge</td>
<td>2 (9%)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Total hip replacement</td>
<td>1</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>1</td>
<td>5 (5)</td>
</tr>
<tr>
<td>4-6 weeks post discharge</td>
<td>2 (9%)</td>
<td>6.5 (6-7)</td>
</tr>
<tr>
<td>Total hip replacement</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>2</td>
<td>6.5 (6-7)</td>
</tr>
<tr>
<td>Post discharge time frame not specified</td>
<td>2 (9%)</td>
<td>9.5 (5-14)</td>
</tr>
<tr>
<td>Total hip replacement</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Total number patients</td>
<td>23 (100%)</td>
<td></td>
</tr>
</tbody>
</table>

A proportion of infections (10/23) noted by the individual patients, developed prior to discharge. Seven infections developed within thirteen days of discharge.
(7/23). The remaining infections, reported by the patients, appear to have developed between two and six weeks post operation (4/23). A time frame between operation and identification of infection was not presented in two cases (2/23). Note that the time frames presented in this results section reflect the wording of the questionnaire design. Three patients were readmitted to hospital as a result of their surgical site infection.

3.3.4 Length of stay

The average length of stay for patients, who had undergone total hip or knee replacement surgery, identifying a surgical site infection, is presented in Table 3.7.

Table 3.7: Procedure specific average length of stay comparing patient reported infection to non infection in relation to total number of cases

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Patient reported infected cases average length of stay (Total number of cases n=23)</th>
<th>Patient reported no infection cases average length of stay (Total number of cases n=424)</th>
<th>National median length of stay * (Total number of cases n=65647)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total hip replacement</td>
<td>4.98 (7)</td>
<td>5.50 (205)</td>
<td>5.0 (31,221)</td>
</tr>
<tr>
<td>Total knee replacement</td>
<td>6.98 (16)</td>
<td>5.54 (219)</td>
<td>5.0 (34,426)</td>
</tr>
</tbody>
</table>

* As presented by Health Protection Agency (2010).

For those patients undergoing total hip replacement and reporting a surgical site infection, the length of stay was 4.98 days compared to 5.50 days for those who did not report an infection. With regard to total knee replacement those reporting a surgical site infection had a length of stay of 6.98 days compared to 5.54 days for those not reporting an infection (Table 3.7). Table 3.7 also presents the national data for comparative purposes. In the national data for both hip and knee replacement a five day length of stay was presented (Health
Protection Agency, 2010). However this national data did not separate infected from non infected cases in their data set.

### 3.3.5 Details of wound discharge characteristics as identified by study participants reporting an infection post joint replacement.

Patients who had reported that they had experienced a post-operative surgical site infection were then asked in the questionnaire to state whether their infection had involved a wound discharge. Results are shown in Table 3.8.

**Table 3.8: Number of patients self-reporting wound discharge**

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>Percentage %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of infected wounds (as reported by patient)</td>
<td>23</td>
<td>100%</td>
</tr>
<tr>
<td>Discharge from wound (as reported by patient)</td>
<td>15</td>
<td>65.2%</td>
</tr>
<tr>
<td>No discharge from wound (as reported by patient)</td>
<td>8</td>
<td>34.8%</td>
</tr>
</tbody>
</table>

If wound drainage was identified patients were asked to choose an option that best described the characteristics of the discharge. These results are presented in Table 3.9.

**Table 3.9: Description of self-reported wound discharge - (n=15)**

<table>
<thead>
<tr>
<th>Types of discharge (as described in questionnaire options)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>2</td>
</tr>
<tr>
<td>Clear + Blood</td>
<td>2</td>
</tr>
<tr>
<td>Blood stained</td>
<td>5</td>
</tr>
<tr>
<td>Yellow / Green</td>
<td>5</td>
</tr>
<tr>
<td>Not described</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
</tr>
</tbody>
</table>
Of the 15 participants who identified that a) they had experienced a post surgical infection and b) had also had a discharging wound, when asked whether a sample was sent to the laboratory: 6/15 reported that a sample was sent, 7/15 reported that no samples were taken to their knowledge, 2/15 were unsure if samples had been taken.

Of the six specimens taken three were swabs and three were fluid samples. The results of these samples are presented in Table 3.10.
Table 3.10: Results of Specimens taken from 6 out of the 15 patients who identified specimens had been taken and who reported a surgical site infection.

<table>
<thead>
<tr>
<th>No</th>
<th>Specimen</th>
<th>Sampling method</th>
<th>Clinical detail sent with sample</th>
<th>Organism</th>
<th>Sensitivities recorded</th>
<th>Resistances identified</th>
<th>Antibiotics prescribed (doses and duration not specified)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Swab</td>
<td>Aseptic wound swab</td>
<td>Slightly red, no discharge</td>
<td>Diptheroid</td>
<td>+</td>
<td>Nil recorded</td>
<td>Co amoxiclav 250/125 mg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Coagulase negative Staphylococcus</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Swab</td>
<td>Aseptic wound swab</td>
<td>Local inflammation wound</td>
<td>Two types of Coagulase negative Staphylococcus</td>
<td>++</td>
<td>Nil recorded</td>
<td>Nil recorded</td>
</tr>
<tr>
<td>3</td>
<td>Swab</td>
<td>Aseptic wound swab</td>
<td>Wound oozing +++ swab request by Dr</td>
<td>Coagulase negative Staphylococcus</td>
<td>++</td>
<td>Nil recorded</td>
<td>Nil recorded</td>
</tr>
<tr>
<td>4</td>
<td>Fluid</td>
<td>Sample taken in theatres prior to washout</td>
<td>?infected hip</td>
<td>Staphylococcus epidermidis</td>
<td>Ciprofloxacin Flucloxacillin Teicoplanin Rifampicin</td>
<td>Nil recorded</td>
<td>Levofloxacin Rifampicin (dose not stated)</td>
</tr>
<tr>
<td>5</td>
<td>Fluid</td>
<td>Collected in outpatient from wound</td>
<td>Oozing wound 14/7 post op to start Flucloxacillin and Fuscidic Acid</td>
<td>No growth</td>
<td>--</td>
<td>--</td>
<td>Flucloxacin Fucidin (dose not stated)</td>
</tr>
<tr>
<td>6</td>
<td>Fluid</td>
<td>Sample taken in theatres prior to washout</td>
<td>Clinically effusion CRP+ WCC</td>
<td>Coagulase negative Staphylococcus</td>
<td>Penicillin Flucloxacillin Teicoplanin Rifampicin</td>
<td>Fuscidic acid</td>
<td>Flucloxacin (dose not stated)</td>
</tr>
</tbody>
</table>
The three swab results all reported coagulase negative *Staphylococcus* as one of the infecting organisms. None of these swabs had sensitivities or resistances reported in the microbiology report sent to the clinician managing the case.

One of the fluid samples taken did not grow an organism; this sample was taken directly from an oozing wound in the outpatient clinic. The two other fluid samples were collected in the operating theatre, prior to surgical intervention. Of interest to note is that both specimens taken in the operating theatre, sensitivities were undertaken and reported as part of the culture process. Table 3.10 shows that the amount of clinical detail varied significantly between specimens taken.

### 3.3.6 Study participant reported contact with healthcare professionals consequent to identification of post surgical infection.

Of the 23 patients who reported experiencing a post-operative surgical site infection, all but one reported seeing a healthcare professional with respect to their infection. The order of visits to healthcare professionals, i.e. how they were referred through the system is shown in Table 3.11.
Table 3.11: Order of visits to healthcare professionals (reported by patients noting wound infection following total hip or total knee replacement) n=23

<table>
<thead>
<tr>
<th>No of Patients</th>
<th>Order of visits to Healthcare professional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General practitioner</td>
</tr>
<tr>
<td>6</td>
<td>1st</td>
</tr>
<tr>
<td>4</td>
<td>1st</td>
</tr>
<tr>
<td>3</td>
<td>2nd</td>
</tr>
<tr>
<td>3</td>
<td>1st</td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2nd</td>
</tr>
<tr>
<td>1</td>
<td>1st</td>
</tr>
<tr>
<td>1</td>
<td>2nd</td>
</tr>
<tr>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Of the 23 patients reporting surgical site infection;

- Six consulted directly with a hospital practitioner (either Doctor or Specialist Nurse) regarding their surgical wound
- Four patients first visited their General Practitioner who subsequently referred them to the hospital for review
- Three patients were first reviewed by a District Nurse, who referred the patient on to a General Practitioner who then referred them to the hospital
- Three patients were visited solely by the District Nurses
- Two patients only visited the Practice Nurse in their local surgery
- One patient discharged to residential care was seen by the nurse in the home who felt that further review was required by the General Practitioner
- One patient, seen by the District Nurse, was referred directly to the hospital for review
- One patient saw the District Nurse and was treated by the General Practitioner
One patient was not seen by any healthcare professional

The above section has outlined the results of the questionnaire sent to 505 of the 523 identified patients having undergone total hip or total knee replacement surgery.

3.4 Summary of results

In summarising the results of Phase One of this study, several factors relating to the incidence and management of surgical site infections have been identified. Of the 447 patient questionnaire included in the data analysis, 23 (5.1%) patients self-reported developing a surgical site infection. A higher proportion of patients who underwent total knee replacement reported infection than those who underwent total hip replacement. In terms of gender there was no difference.

In relation to the time frame in which surgical site infection was identified, the majority of infections developed within the first two weeks post surgery. Of the 23 patients reporting a surgical site infection 15 reported discharging wounds, whilst the remaining eight reported no discharge. In relation to confirming infection against laboratory results of the 15 reporting discharging wounds only six had specimens taken, only one of which failed to grow an organism.

All but one patient who self-reported a surgical site infection had an interaction with one or more healthcare professionals in terms of managing their infection. The number of different healthcare practitioners seen by individuals varied, with six seeing only a hospital healthcare practitioner, with the remaining 16 seeing
practitioners in primary care first, before in some cases, being referred into the hospital for further management.

3.5 Discussion of Phase One

Surgical site infection and the increased morbidity, pain discomfort, cost and inconvenience this causes is according to Wilson et al, (2004) a substantial burden to both patients and healthcare providers. Initiatives that have the potential to reduce surgical site infection should be employed at all stages of the patient pathway. Surgical site surveillance, if well planned, well executed and well evaluated has the potential to be one such initiative.

Surgical site surveillance has been the mainstay in the battle against surgical site infection. The Study on the Efficacy of Nosocomial Infection Control (SENIC) showed that surveillance and infection control programmes, that were well organised with feedback of relevant information to clinicians, reduced the incidence of surgical site infection (Health Protection Agency, 2008). Since the introduction of a national surveillance system in England from 1997 there has been a continual drive to evolve this service. In April 2004 surveillance of orthopaedic surgical procedures, in relation to surgical site infection, became mandatory. When surgical site surveillance was first introduced the focus remained on monitoring the patient solely during the inpatient stay. However the continual reduction of inpatient length of stay, especially following elective procedures, means that the incidence of surgical site infection was not being accurately recorded by the surveillance methods currently being used (Health Protection Agency, 2008). The Health Protection Agency has gone some way to improve the accuracy of the data by the mandatory inclusion of patients
readmitted within 30 days of discharge for infection. However the use of the post discharge surveillance questionnaire developed by the agency and the inclusion of patients who have post-operative infections identified (without readmittance) within the outpatients setting remains an optional, rather than mandatory part of the national surveillance.

Besides the mandatory surgical site infection surveillance, infections following joint replacement surgery are also recorded in the United Kingdom National Joint Registry. Joint Registries are currently in use in Sweden, Norway, Finland, Australia, New Zealand, and Canada as well as via individual healthcare providers in the United States of America. These registries are not owned and run by the implant manufacturers, but by government agencies. The establishment of such a registry, in the UK, came following recommendations from the National Audit Office and the National Institute for Clinical Excellence. These recommendations were made following the Royal College of Surgeons report into the failure of 3M Capital hip replacement (NJR, 2004). The information these Registries generate relate to specific implant use and long term outcomes of these implants in relation to survivorship as well as reasons for implant failure. Data relating to the incidence of infection in joint replacements has been collected in the United Kingdom, by the National Joint Registry since 2003. The difference between the two data sets is based on the end point at which data is recorded. In the case of the Nosocomial Surgical Site Infection Surveillance Service this is 30 days post surgery. The National Joint Registry uses the number of revision operations undertaken, where implant failure and subsequent revision surgery is required because of infection, to determine the rate of infection. This represents a much longer post-operative
time frame than the 30 days period used by the National Surgical Site Surveillance Service.

3.5.1 Comparison between local and national demographics

Compared to the number of joint replacements undertaken nationally in 2009 (n=150,284) (NJR, 2010), the sample size of 447, is relatively small. Locally the average age range for patients undergoing total hip replacement was 57.5-67.5 years compared to an average age of 80 years in the national data set. For total knee replacements locally the average age range was 65.5-69 years compared to an average of 70 years nationally. The local data set identified that 41% of those undergoing joint replacement surgeries were male and 59% were female. The national data set reflects similar percentages, with 42%-43% of joint replacement surgery being carried out on males and 57-58% on females.

3.5.2 Comparison of local to national infection rates

Comparisons between local data collected as part of Phase One of this study and the data collected as part of the NSSISS have been made so that the results of this study can be placed in context with the national data. It should be noted that there are differences between how the two data sets were collected; these are presented in Table 3.12.

Table 3.12: Comparison between the methods used by the National Surgical Site Infection Surveillance Service the present study.

<table>
<thead>
<tr>
<th>National Surgical Site Infection Surveillance</th>
<th>Present study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Records number of infections identified during inpatient or readmission</td>
<td>Records number of infections identified within six weeks of surgery</td>
</tr>
<tr>
<td>Large Sample</td>
<td>Small sample</td>
</tr>
<tr>
<td>Infections identified by clinically qualified staff</td>
<td>Patient reported surgical site infections.</td>
</tr>
</tbody>
</table>
During the study period, data collected and reported (for a one quarter period) to The Surgical Site Infection Surveillance Service, indicated no infections were identified through inpatient or readmission. The present study however identified that there were ten infections, which the current National Surgical Site Infection Surveillance methods, had not detected. Data collected as part of this study presents important clinical information within the boundaries of surgical site infection surveillance. The present study data set incorporated the whole 30 day surveillance period, rather than inpatient and readmission data only and as such represents a more comprehensive surveillance record.

The change in the way the Nosocomial Surgical Site Infection Surveillance is undertaken, to now include readmission rates, identified that 41% of the surgical site infections identified were recorded on readmission data (Health Protection Agency, 2010). What the present study data captures are those patients who identified a surgical site infection post discharge and who were not necessarily readmitted into hospital, but had their infection treated within the Primary care setting. The data collected shows the time frame at which the surgical site infections were identified.

3.5.3 Time frame from surgery to identification of infection

Of the 23 (5.1%) patients self-reporting surgical site infection 13 patients identified their infection developing post discharge from hospital. Of these 13 patients, self-reporting a surgical site infection post discharge, only three patients were readmitted to hospital. In line with National Surgical Site Infection Surveillance data this means that potentially ten patients reporting infection would not have been included in the reported data. This represents 43.5% of
the total number of infections reported by patients in this study. However what cannot be determined from this study is how many of these self-reported infections were verified as infections based on clinical criteria.

Under half (n=10/23) of the total number of self-reported infections were identified prior to discharge. With a continual drive towards reducing the inpatient length of stay following total hip and knee replacement surgery it can only be expected that the number of infections developing post discharge will continue to rise. A review of the Surgical Site Infection Surveillance data after hip hemiarthroplasty identified that the median time to identification of superficial incisional infection was eight days (Ridgeway et al, 2005). Although the data presented by Ridgeway et al was only collected during the inpatient stay and encompassed patients who had undergone hemiarthroplasty of the hip due to trauma, what it does identify is that a proportion of these patients might not have been identified using current surveillance programmes based on contemporary length of stay data.

**3.5.4 Length of stay**

The length of stay reported for both total hip and total knee replacement patients within this study is similar to the nationally presented data reporting average length of stay. What is important to note, in relation to patients undergoing total hip replacement, is that within this study those patients who reported a surgical site infection had a slightly shorter length of stay than those that did not report infection. The reverse of this is true for patients undergoing total knee replacement surgery reporting infection who had an increased length of stay. Total hip replacement surgery involves a joint that is surrounded by
more soft tissue structures than total knee replacement (which is a more superficial joint). As such the clinical signs and symptoms of surgical site infection may take longer to present at the wound surface of a patient with a hip replacement, and as such the infection would take longer to become evident at the surgical site.

### 3.5.5 Wound characteristics

Of the 23 patients who reported surgical site infection, 15 of those reported that their wound infection had discharged fluid. Of these 15 discharging wounds six had swabs taken. Local data showed that the majority of swabs grew Coagulase Negative *Staphylococci* (CNS) (four out of six swabs). This does not correspond with the data presented in the NSSISS data which suggests that *Staphylococcus aureus* remains the most common pathogen reported in surgical site infections (Health Protection Agency, 2010). The difference may be accounted for in that the NSSISS includes all orthopaedic trauma in which fixation devices are used and not solely joint replacement surgery. Moran et al, (2010), reviewing the microbiology of infections in prosthetic joints, support the results found in the study presented here suggesting that CNS infections account for 30%-41% of the infections identified, whereas *Staphylococcus aureus* accounts for between 12%-39%. Phillips et al (2006) found similar results when conducting a 15 year prospective study of the incidence of deep infections in joint replacements where 36% were CNS infections compared to 25% for *Staphylococcus aureus*.

Of note is, that of the patients that were identified as Meticillin Resistant *Staphylococcus Aureus* (MRSA) positive pre-operatively (6/447) none of these patients went on to identify themselves as having an infection. However, all six
patients who were MRSA positive received an MRSA bio-burden reduction kit to use for washing for five days prior to surgery. (Bio-burden reduction kit contained, at the time of surveillance, mupirocin nasal cream and chlorhexidine cleansing solution and chlorhexidine body powder.) Although the numbers in this study are relatively small, the findings support the use of MRSA bio-burden reduction kits in reducing the incidence of infection, with MRSA, from those identified as MRSA carriers.

Several other important features became evident when exploring the results of the swabs that had been taken. Firstly, that the clinical information completed on the swab request forms was of such poor quality that microbiologists receiving the swabs had no indication that the patient had recently undergone joint replacement surgery. Secondly, as a result of the poor clinical information on the specimen request form, the swab was not processed in such a way that antibiotic sensitivities and resistance to organisms grown were always identified. This meant that antibiotic treatment was not directed towards treating the specific organism.

Antibiotics were prescribed for all patients who had wound specimens taken. What cannot be determined from the completed questionnaires was who prescribed these antibiotics and whether they were prescribed before or after the specimens were taken. Only one patient had an antibiotic prescribed that is recognised as effectively penetrating the biofilm formed around prosthetic joints. Mathews et al, (2009) present a table of suggested antibiotic use depending on the infecting organism. In the case of coagulase negative Staphlococci they recommend the use of a combination of antibiotic therapies, namely rifampicin.
plus another agent. What is shown in Table 3.10 is that none of the patients identified with coagulase negative *Staphlococci* had the correct antibiotics prescribed according to Mathews et al's recommendations. The inappropriate use of antibiotics has implications in terms of the development of antibiotic resistance and that this resistance is more evident in nosocomial infections (Yates, 1999).

### 3.5.6 Management pathways

It is important that management of suspected infections in joint replacement patients follow recognised evidence based guidelines. Moran et al, (2010) and Mathews et al (2009) both present algorithms for the management of patients presenting with suspected infection following hip or knee replacement surgery. Local guidelines for the management of patients with suspected infection following total hip or knee replacement follow this evidence base and have been distributed across both primary and secondary healthcare professionals who may interact with this patient group (Appendix 6). These local guidelines recommend that any suspected surgical site infection be reported back to the Orthopaedic Department for review before the commencement of antibiotic treatment. Patients prior to discharge are given the relevant hospital healthcare professionals contact details so they know who to contact in the event they feel they may developing problems with their wound. However what this study identified is that although these management pathways are available to both healthcare professionals and patients alike only six of the 23 patients reporting surgical site infections sought review with the hospital healthcare professional. The other 17 either sought review with their General Practitioner or the District Nurse.
Although local and national management pathways exist, this study highlighted the variety of pathways patients self-reporting a surgical site infection underwent. However this information does not tell us what these patients who develop a surgical site infection post-surgery personally experience. It does not tell us what they experience in terms of the emotional, psychological and physical elements associated with an individual developing an infection or in relation to how they were treated once a potential infection was suspected.

In Chapter Four, the experience of those who identified they had developed a surgical site infection are explored using a qualitative approach informed by descriptive phenomenology.
CHAPTER 4: PHASE TWO A PHENOMENOLOGICAL INVESTIGATION INTO THE LIVED EXPERIENCE OF A HAVING A SURGICAL SITE INFECTION

4.1 Introduction

Recent government directives, such as the Health and Social Care Bill for 2010/11 (Department of Health, 2011), places the patient experience at the centre of NHS reform recommending patients are given a choice of where and how their care is provided. The voice of the patient is likely to play an even stronger part in the way that future services are planned. The King’s Fund Point of Care project is one such venture, launched at a time when the Department of Health announced initiatives designed to focus on improving patients’ healthcare experiences (Coulter, Fitzpatrick and Cornwell, 2009). The Point of Care project utilized qualitative research methods to collect data from patients, their families and staff about their experiences of hospital inpatient care combined with a review of current literature and relevant government policy. Experiences shared by patients and their families gave what Goodrich and Cornwell (2008) described as a ‘human dimension’ to their analysis. From this report, greater understanding about the concepts of the hospital experience, from the patient’s perspective, and the meaning of ‘patient centred care’ provided indicators on how to improve this experience. As a result of the proposed changes (in the way in which healthcare is designed and delivered) government policy is currently being re-drawn with an increased focus on the personalisation of public services (DOH, 2009). To date there is limited research focussing on the patient’s experience of developing and coping with surgical site infection.
The aim of this phase of the study is to gain an understanding of patient’s experience of surgical site infection (self reported within six weeks of surgery). As such Phase Two of this study utilizes a qualitative research design informed by descriptive phenomenology. The rationale for choosing this approach is discussed below.

4.2 Methodology

In order to meet the aim of Phase Two of this study I adopted an interpretative epistemological framework. The rationale for using this approach is based on ontological and epistemological beliefs. Ontology relates to the nature of knowledge and how it is classified, whilst epistemology relates to how knowledge is acquired. Interpretive methodologies differ from positivist approaches in several different ways. The interpretive focus lies in a set of ontological and epistemological beliefs; in which there is no objective measurable truth but reality exists in the thoughts and perceptions of the individual. This is in contrast to a positivist’s approach which focuses on an objective, analytical search for the truth, with the emphasis being on defining and adhering to a strict methodological protocol (Samdahl, 1999). Within the context of this study, the ontological view ascribed to is based within an interpretivist framework and, as such, the belief that people assign meaning and interpretation to their experience. Epistemologically, knowledge is socially constructed and is relative to the ‘knower’. Interpretive epistemology sits within a qualitative framework which seeks to understand phenomena in a ‘context specific’ or from a ‘real world’ stance where data is not manipulated (Patton 2002). This type of epistemology accepts the ‘multiple realities’ of phenomena.
As such each individual may experience the same phenomenon, but the experience presents itself differently to each individual, a ‘personal reality’ to the phenomena (Krauss 2005). In accepting the ‘multiple realities’ associated with everyday phenomena the ontological viewpoint presented is that there is no objective reality (Krauss 2005). This would suggest that the ontological aspect (what we know) is affected by the epistemology (how we know it) through the way we have experienced our life and assimilated these experiences as reference points throughout our development. As such this interpretive focus provides a suitable framework in which to explore the individual’s experience of surgical site infection

Whilst objective quantitative research approaches in healthcare research measure patient outcomes, they tell us little about how the patient feels about the phenomenon being investigated. However methodologies grounded in an interpretivist approach offer a useful way of exploring patient experiences. Interpretive methodology provides an opportunity to shed light on the contextual dimensions of health, through the use of narratives and life stories from those who have experience. It is an appropriate methodology to address these aims.

In utilising this interpretive epistemology as the foundation for this study, the essential essences that constitute the experience behind the phenomena associated with surgical site infection will be explored. The experiences and behaviours relating to the complexities that human beings face, within such a situation, can thus be investigated. Whilst there are many approaches to qualitative research a decision was made to use a descriptive phenomenology approach.
4.3 Phenomenology

Phenomenology is a philosophical approach to qualitative data collection and analysis which is designed to access the meaning of phenomena by exploring the experience of those who have been subjected to it, revealing meaning to everyday experiences (Flood 2010) rather than universal principles (Kleiman, 2004; Porter, 1999). Phenomenology is considered an overarching term that encompasses a philosophy as well as an assortment of research methods (Finlay 2009). Phenomenology presents itself as an investigation of the drama of human experiences within the world; considered an 'active-sensitive understand' method which finds its start and end in the practical acting out of everyday life experiences (Vangie, 1989).

Having identified phenomenology as a means to help achieve these aims the appropriate phenomenological approach was sought. The two most commonly cited approaches to phenomenology are originally attributed to Edmund Husserl and Martin Heidegger.

4.3.1 Husserlian phenomenology

Edmund Husserl, a former mathematician turned philosopher, is considered the founder of phenomenology. The viewpoint of Husserl, that the phenomenon can be described instead of explained, focuses on how things are presented within the world (Sadala and de Camargo Ferreira Adorno 2002). This is presented as (transcendental) descriptive phenomenology.
4.3.2 Heideggarian phenomenology

In contrast, Heidegger, a former student of Husserl, held a differing view that instead of describing phenomena revealed in the world, he presents a connection between the lived experience and how this is perceived based on interpreting previous experiences (Standing 2009); this approach is described as (hermeneutic) interpretive phenomenology.

Both these two philosophers produced a philosophical framework rather than an actual methodology that could underpin phenomenological research (McConnell-Henry, Chapman and Francis, 2009). This has led to some confusion and differing opinions as to how to translate the philosophical framework into a research methodology. However, since the aim of this study is to provide a description of the experience, rather than an interpretation of it, Husserlian phenomenology was chosen to fulfil the aims of this study.

4.4 Husserlian transcendental phenomenology

This study aims to explore the participants’ experience of surgical site infection following either total hip or total knee replacement surgery and therefore is based within the ethos of descriptive phenomenology as presented by Husserl. Descriptive phenomenology is presented as a descriptive science of essences and actions of consciousness contained within an experience (Sadala and de Camargo Ferreira Adorno 2002) and involves analysis and synthesis of these experiences through a dialectical process (Rapport and Wainwright 2006).

The intention of this type of exploration, as presented by Wojnar and Swanson (2007) is to describe the participant’s experience (in this case, having an infection) and from this description identify the universal essence of such an
experience. As such, consciousness is translated into meaning (Woodruff Smith, 2007).

According to Giorgi (1997), the phenomenological method does not aspire to taking the world for granted but instead seeks to understand what motivates an individual to ascribe meaning to a phenomenon. Pivotal to Husserl’s work, is the recognition that experience is central to the meaning of knowledge (Koch, 1999). In this study, the aim is to create a collection of individual experiences which can then be shared with other healthcare practitioners to inform practice.

4.4.1 Husserl’s phenomenological framework

Phenomenology is not a research method in itself but a philosophy. Priest (2003) identifies that Husserlian phenomenology consists of four essential processes namely; intentionality, phenomenological reduction, description and subsequent identification of the essence of the phenomena. Table 4.1 outlines the descriptions relating to these four essential processes as an introduction to these concepts from a Husserlian phenomenological stance.
Table 4.1: The four main processes involved in Husserlian phenomenology as presented by Priest (2002)

<table>
<thead>
<tr>
<th>Essential process</th>
<th>Description of process</th>
<th>Key supporting references</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intentionality</td>
<td>Consciousness forms the basis of all understanding</td>
<td>Rapport and Wainwright (2006)</td>
</tr>
<tr>
<td></td>
<td>Consciousness consists of a combination of an experience and an act</td>
<td>Woodruff Smith (2007)</td>
</tr>
<tr>
<td></td>
<td>Husserl names these ‘noesis’- act and ‘noema’- experience</td>
<td>Russell (2006)</td>
</tr>
<tr>
<td>Phenomenological reduction</td>
<td>An attitude entered into by the researcher consisting of firstly, bracketing previous knowledge and secondly, to consider what is presented precisely as it is presented.</td>
<td>Giorgi (1997)</td>
</tr>
<tr>
<td>Description</td>
<td>Phenomenological data is unashamedly descriptive</td>
<td>Langdridge (2008)</td>
</tr>
<tr>
<td>Essence</td>
<td>Essences are sought from the data. To ensure completeness and accuracy of descriptions a process known as free imaginative variation is entered into</td>
<td>Giorgi (2008)</td>
</tr>
<tr>
<td></td>
<td>Presenting the data in such a way that someone who has not experienced the phenomenon can appreciate what it means for someone who has</td>
<td>Thorne (2000)</td>
</tr>
</tbody>
</table>

4.4.2 Intentionality

In order to understand the way in which phenomenology is presented there is a need to understand the terminology used within this philosophical approach. According to Moran (2001) Husserl’s overall aim, with his phenomenological method was to identify a means of clarifying the essential nature of knowledge.

As such an analysis of what Husserl describes as intentionality, consisting of both the ‘noema’ being the intentional experience, and the ‘noesis’ being the manner in which it is experienced, form the foundation of the phenomenological method. The way in which individuals present this ‘intentionality’ is represented by the term ‘natural attitude’. As such the ‘natural attitude’ is constructed of multiple ‘intentionality’. The natural attitude is an important concept within phenomenology and is presented in terms of what is labelled as the ‘lifeworld’. Husserl explains the natural attitude as the way in which each of us is involved in the ‘lifeworld’ (Russell, 2006). Both the noema and noesis of phenomena can
be explored and individually represented; however they remain interconnected, such interconnection means that one will always affect the other and the way in which it is perceived.

One way of exploring this intentionality is through the use of in-depth personal interviews. By asking those who have lived the experience ‘to tell their story’ the belief about the experience (the noema); and the act that presents this belief (the noesis) can be presented. In this study, one-to-one in depth interviews provide an opportunity to access the experience and as such state the intentionality of this phenomenological investigation.

The other essential processes required achieving Husserlian phenomenology, namely phenomenological reduction, description and essence together with the rationale for their use are presented throughout descriptions of the method (section 4.5.3 and 4.5.4) and data analysis sections (section 4.7).

4.5 Method

4.5.1 Ethics

Ethical approval for this study was granted by the Isle of Wight, Portsmouth & South East Hampshire Research Ethics Committee on the 8th August 2009. A more detail description of the whole ethics procedure has already been presented in section 3.1.2.

4.5.2 Patient selection

Patients for inclusion in this phase (Phase Two) of the study were identified from Phase One of the study. This was a purposeful sample of patients: twenty
three patients who self-reported a surgical site infection were eligible to be included in the study. Of these 23 patients 15 patients were willing to be contacted, six did not want to be contacted and two failed to respond to the invitation set out in the questionnaire. Figure 4.1 shows participant flow through Phase Two (qualitative interviews).

The 15 patients willing to be contacted were sent an invitation letter outlining the rationale for the study (Appendix 7) and full written patient information leaflet. The patient information sheet explained the purpose of the study, the degree of involvement as well as full contact details of the researcher (Appendix 8). Patients were then asked to contact the researcher for further information or, if willing to take part, to arrange an appropriate date, time and venue for the interview to take place.

Of the 15 patients invited to be interviewed only nine contacted the researcher and arranged interviews. Interviewees were offered the choice of where the interviews were conducted. Table 4.2 identifies the patients in terms of gender, age, type of surgery and interview venue.
Table 4.2: Interview patient Characteristics and interview location

<table>
<thead>
<tr>
<th>Interview</th>
<th>Gender</th>
<th>Age</th>
<th>Type of surgery</th>
<th>Interview Venue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>79</td>
<td>Knee</td>
<td>Own Home</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>75</td>
<td>Hip</td>
<td>Own Home</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>65</td>
<td>Knee</td>
<td>Hospital clinic room</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>66</td>
<td>Hip</td>
<td>Own Home</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>70</td>
<td>Knee</td>
<td>Place of work</td>
</tr>
<tr>
<td>6</td>
<td>M</td>
<td>64</td>
<td>Knee</td>
<td>Own Home</td>
</tr>
<tr>
<td>7</td>
<td>M</td>
<td>80</td>
<td>Hip</td>
<td>Own Home</td>
</tr>
<tr>
<td>8</td>
<td>M</td>
<td>63</td>
<td>Knee</td>
<td>Hospital clinic room</td>
</tr>
<tr>
<td>9</td>
<td>F</td>
<td>50</td>
<td>Knee</td>
<td>Own Home</td>
</tr>
</tbody>
</table>

In summary there were two female and seven male interviews representing six knee and three hip replacements. The ages ranged from 50-80 years old. Five patients chose to be interviewed in their own home, two in the outpatient clinic at the hospital and one in their place of work.

4.5.3 Phenomenological reduction: stage one

Prior to undertaking data collection, it was important that I undertook the second essential process, phenomenological reduction, to be aware of my own pre-conceived ideas and biases. This constitutes a fundamental part of the Husserlian phenomenological method. Phenomenological reduction is given a variety of titles in the literature such as, bracketing, eidetic reduction and epoché (Priest, 2003). Giorgi presents the phenomenological reduction as an attitude that is entered into in phenomenological research and presents this as two fold:

- Firstly, the bracketing of previous knowledge
- Secondly, transcendental consciousness, to consider what is presented precisely as it is presented (Giorgi, 1997).
4.5.3.1 Bracketing of previous knowledge

Bracketing is an important aspect of the phenomenological enquiry based within Husserlian framework. The concept of bracketing involves the researcher removing their own bias and preconceptions to the study (Lopez and Willis, 2004), or ‘that they put their own personal reality on hold’ (Rapport and Wainwright, 2006). Hamill and Sinclair (2010) present a useful list of questions to support the researcher in successfully achieving the process of bracketing; the first of these being that the researcher brings forward to consciousness every known element of the topic under review. To fit within the interpretative epistemological approach and the descriptive phenomenological method used within this study Gearing suggests that descriptive bracketing is the most appropriate bracketing method (Gearing, 2004). Gearing suggests that the process of bracketing consists of three general phases; firstly, abstract formulation, secondly, research praxis and finally, reintegration (Gearing, 2004).

Abstract Formulation

The first phase of Gearing’s process of bracketing is that of abstract formulation. This consists of presenting the orientation standpoint in relation to the epistemological and ontological views of the researcher and the qualitative theory guiding the researcher. It involves exploring personal beliefs about how knowledge is generated. As part of a personal development portfolio I had already explored my personal beliefs about knowledge construction and how I believed that everyday interactions shaped individual’s personal beliefs. I explored, through the literature, the concepts of experiential learning and undertook a discussion with Richard Adams from the Cochrane Centre on the issue of ontology and epistemology in terms of research methodology (personal
communication, March 30, 2011). As previously presented in section 4.2, in this instance, my personal belief is that people assign their own meaning and interpretation to experiences. As such knowledge is socially constructed and is relative to the ‘knower’. This gives rise to interpretivist ontology and epistemology as the abstract formulation in respect to this study.

**Research praxis**

The second phase of Gearing’s bracketing is that of research praxis. This is considered the core element of bracketing; exploring the researcher’s suppositions both in terms of internal factors (personal knowledge, experience and values) and external factors such as environmental factors, history and definition of the phenomenon being investigated. Within this study the internal factors relate to the knowledge base generated through my professional training, the external factors relate to the clinical environment within which I work and the way that has evolved through time and experience. Extracts from reflections undertaken regarding my previous experiences are presented in Appendix 9.

Before developing the interview schedule I bracketed aside all previous knowledge, pre-suppositions or expectations relating to the experience being explored. The topics included in this bracketing related to:

- My previous experiences relating to the diagnostic processes of identifying surgical site infection
- My understanding and use in clinical practice of the correct treatment protocols for individuals suspected of having an infection
My 20 years experience as an orthopaedic nurse caring for patients with infections following joint replacement surgery

My clinical knowledge about the potential causes of surgical site infection

My current involvement in patient pathways of care and service design

Le Vasseur (2003) suggests that this process of bracketing is a purge from the 'natural attitude' to the 'phenomenological attitude'. It plays an important part in the process of concentrating the researcher to the essences of the phenomenon explored as presented by those who have lived it. Bracketing itself is not considered the complete elimination of preconceived ideas. Le Vasseur describes it as a temporary suspension of them so other perspectives can be discovered (Le Vasseur, 2003). As such this change in 'attitude' allowed me to be open to the experiences being presented to me by the individual patients. It was also important to ensure that data obtained from individual interviews did not affect data collection by inadvertently 'un-bracketing' previously bracketed assumptions and preconceptions about the experience being explored. As such interviews were conducted with at least a three day gap between interviews and bracketed data was revisited prior to each interview taking place to reduce the potential for 'un-bracketing'. A reflective diary was used to collect information relating to the interview process and salient points regarding individual interviews.

Reintegration

Reintegration, the third phrase within the bracketing process, involves what Gearing (2004) describes as a process of removing bracketed data and
integrating and ‘reinvesting’ this data back into the investigation as a whole. The way in which data is reintegrated, is according to Gearing, dependant on the type of bracketing undertaken (Gearing, 2004). In relation to the descriptive bracketing, reintegration requires the researcher to reintegrate the raw bracketed data after the phenomena has been investigated (Gearing, 2004). Reintegration occurred following the initial data analysis, (in which bracketed data was continually revisited to reduce the potential for ‘un-bracketing’). The emergent themes were then reviewed alongside bracketed data and data contained within the reflective diary to ensure that personal suppositions did not affect subsequent data analysis and the emergent themes generated. The reintegration phase involved placing the findings alongside the bracketed data so that they could be discussed in relation to the findings. This was an important phase, within the whole bracketing process, in providing clarity to meanings obtained from the data generated after bracketing had occurred (Gearing, 2004). Comparisons were then made between the findings obtained from this study and the bracketed data (bracketed data represented my personal suppositions relating to the topics being explored). This process ensured that the findings were embedded in the data and not a reflection of my preconceptions.

Presented above are the three phases contained within the first part of phenomenological reduction and relate specifically to the initial bracketing phase. The second part of the phenomenological reduction the transcendental consciousness is presented next.
4.5.3.2 Transcendental consciousness

The second part of phenomenological reduction has been termed 'transcendental consciousness', which requires the interviewer/analyst to remain open to the reality of other's experience (Wojnar and Swanson, 2007) without prejudice of previous experiences. This advocates that the researcher must approach each individual interview without being influenced by the experiences of the other participants. Beech (1999) also highlighted this as an important methodological consideration in relation to maintaining the ‘phenomenological attitude’ following interviews whereby the acquisition of new information relating to the phenomena being investigated, must be explored in order to allow the interviewer to continue to transfer between their new ‘natural attitude’ (that has resulted because of the new information obtained) and the ‘phenomenological attitude’ required prior to subsequent interviews.

After each interview I immediately made notes and undertook a reflective review of additional information gained; I noted any additional information to that previously identified. By bracketing aside my preconceptions and suppositions regarding what I would expect this patient group’s experience to be (standing outside my own ‘natural attitude’) I allowed my attitude to become transcendent. This process of ‘transcendental consciousness’ occurs alongside the initial bracketing and prior to each individual interview. This was so that experiences presented in previous patients’ stories would not be influencing the way in which I interviewed subsequent patients. I also referred to the notes made following each interview, as I was analysing the transcripts relating to that interview to ensure the formulated meanings, I attached to the significant statements.
identified from the transcripts, represented the data and not my preconceived notions about what was being presented.

4.5.4 Description and essences

The Husserlian phenomenology, through its method of data collection, provides rich descriptive data that relates to the phenomenon being investigated. These descriptions are then analysed to provide the essence of what constitutes the phenomena and what does not. It is the identification of the essential essences of a phenomenon that allow it to be identified (Paley, 1997). These descriptions and essences are brought out through the data analysis process and the methods used to achieve this are presented in section 4.9.

4.6 Data collection

4.6.1 Unstructured Interview schedule

Mapp (2008) suggests that the optimum method of data collection, in any type of phenomenological investigation, is the use of one-to-one interviews. The aim of the qualitative interview, as presented by Taylor (2005), is to explore the ‘insider perspective’ and to capture experiences, feelings and perceptions using the participant’s own voice. The researcher’s role, when undertaking unstructured interviews, is to remain as unobtrusive and to let the interviewee develop their own ideas (Denscombe, 2003). So, for the purpose of allowing the interviews to proceed without structure, I conducted open ended unstructured interviews which asked the patient to describe their experience of having developed a surgical site infection. The only instance in which the story was
interrupted was when clarification was sought regarding points presented; an example of such prompting is presented in section 4.7.2.1.

Face to face encounters such as those that occur during interviews enable the researcher to collect and present the nuances of participants experience alongside the words collected on audiotape. Field notes were taken during interviews that collected non verbal data relating to mannerisms, emotions and other nonverbal clues pertaining to the story being presented. These were annotated into the transcripts at the relevant place so they could be considered alongside the written text within the analytical process.

An interview schedule (Appendix 10) was used as a guide as well as being part of the ethical approval recommendations. Although the interviews were to be unstructured in nature an underlying structure to the interview process helps to make this process explicit for the purposes of trustworthiness. In this instance structure refers to the broad outline of how the interview process was conducted. The schedule provided such structure and consisted of three main sections. The first section collected the patient demographics and checklist to ensure that the correct processes had been followed in relation to obtaining informed written consent.

The second section contained the opening sentences of the interview:

“Please describe in your own words your experience of going into hospital for your total knee/hip replacement surgery. Then following on
from sharing this experience, having left hospital can you share your postoperative recovery at home, is that OK?”

These opening sentences were used for every interview and participants were asked to start their experience at whatever part of the hospital journey they thought was appropriate for them. It was important that they determine when, in their view, the process commenced, rather than specifying a single predetermined point for all interviews to begin. This method of interviewing fits within the Husserlian approach where the aim is to obtain description of the events as perceived by those experiencing it without influencing the way in which the experience is presented.

Finally, the third section of the schedule contained the post interview reflective questions for the researcher to complete. These reflective questions were useful in helping me to continually evaluate my interview technique to help ensure they remained true to the phenomenological interview process.

4.6.2 Practice interview

My previous experience of research interviewing was limited to focus groups interviews where the emphasis was on ensuring that the members within the group had a voice and that their views were heard. Having made the decision to undertake individual face to face unstructured interviews I decided that a practice interview would be helpful. I felt it would provide insight into one to one face to face interviews, allowing me to try out the opening question to ensure it was understandable whilst exploring my interview technique. I conducted a practice interview with a colleague, who had recently been in hospital and was
willing to share her experiences for the purpose of practicing my interview technique. The interview audio tape was replayed to my clinical supervisor so that advice and feedback could be obtained to ensure that the interviews undertaken would collect the data required.

The feedback received from the practice interview highlighted areas where perhaps I could have probed a little more to clarify meaning and to obtain thicker descriptions. Using words like “can you tell me a little more” rather than nodding in agreement highlighted, to me, the potential to obtain richer and more descriptive information in a way that would not affect the responses given. As a result of the practice interview I became much more aware of my role as interviewer. Before the practice interview, I had assumed a passive role in which I asked the opening questioning and let the patient tell their story without fully engaging. However following the practice interview I felt more confident in encouraging elaboration to obtain richer descriptions, without the worry that I would influence the patient’s story.

4.6.3 Interview Venue

An important element to consider within the construct of the interview is the location in which the interview is conducted. Wilson describes this element as an asymmetry of power when conducting person interviews. This asymmetry can be in favour of the researcher, or the participant, depending on where the interviews are conducted. (Wilson, 2009). In order to ensure that participants were in control and empowered they were given the choice as to where and when they wished the interviews to be conducted. Of those interviewed six requested the interview took place at their home, two requested the hospital
and one requested that the interview was undertaken in their workplace which was close to their home. For interviews that were conducted in the hospital, this was carried out in the outpatient department in a clinic room. The telephone was diverted to main reception and a ‘do not disturb-interview in progress’ sign was placed on the door.

4.6.4 Consent to interview

For the qualitative in-depth interviews, fully informed consent was obtained for each individual participant who took part. The consent process involved ensuring patients had time to read the patient information leaflet that had been sent to them (prior to the interview being scheduled), and that they had an opportunity to contact me to ask questions before proceeding. Again after arranging the interview, prior to commencement, I checked understanding of the purpose and process of the proposed study and what their participation would involve. Questions were sought and time given to answer any questions that arose. Confirmation was sought that patients agreed to have the interview audio taped and that they would be willing (if randomly selected) to receive a copy of the initial analysis of their interview and provide comments as necessary. Participants who agreed to be interviewed, but not to receive randomly selected interview transcripts were reassured that they could still take part in the interviews, if they wished. Written agreement was also sought to access the results of microbiological specimens that had previously been analysed as part of their ongoing management for infection following total hip/knee replacement. To ensure confidentiality, names of participants were removed from all interview transcripts and instead annotated with initials only. Adding the date of interview, all scripts were stored in a password protected computer on a secure hospital
network and data was backed up regularly on a password protected encrypted data memory stick that was stored in a locked filing cabinet within the hospital setting. Access to transcripts was restricted to me or my academic supervisor only. The audio tapes were also stored in a locked cabinet within the hospital setting. Destruction of the tapes will occur on completion of the Doctoral programme.

If they were satisfied with the above points each participant signed the written consent form. Each participant signed two copies of the consent form, one they kept and one that went into the research file.

4.6.5 Audio taping

The importance of preserving the spontaneity and details presented in the lived experience is an essential element of phenomenological enquiry; most commonly achieved by audio taping interviews (Jasper, 1994). Interviews were recorded using a Sanyo mini talk book audio taping machine so that interviews could be transcribed verbatim. At each interview new tapes were used so that the quality of recordings was optimised. Spare tapes and batteries were taken to prepare for extended interviews. Notes were also taken during the interview to highlight any non-verbal signals, so that the nuances and non verbal elements of the communication were not missed. These non verbal elements to the data can help contextualise emotions within the data (Boeije 2010). Reflective notes were taken after each interview as previously described at section 4.5.3.
4.6.6 Verbatim transcription

As soon as possible after each interview, I transcribed the audio tapes so that the data was still fresh in my mind. The maximum time between interview and completed transcription was approximately two days. Denscombe (2003) states that although transcription can be a time consuming process it is imperative that the researcher undertake this process as it brings the researcher into the data, an important consideration in phenomenological enquiry. I personally transcribed all interviews conducted, five hours and forty minutes of interview, which took approximately twenty six hours to transcribe. Remaining close and involved within the data enhanced familiarity and continuity with the data across the interview, transcription and analysis process.

4.7 Data analysis

This section describes the data analysis method with examples to illustrate processes involved. The actual findings from the analysis are presented in section 4.8. Considerable thought was given to how best to conduct data analysis of the interviews. Data analysis within a phenomenological framework is guided by a method for analysis that is compatible with the philosophical underpinnings of the research being undertaken (Flood 2010). On the other hand, qualitative data analysis is a creative process, involving intuition, and empathy and cannot be reduced to a mere mechanical process (Webb 1999). Careful consideration needs to be given to what Barritt, Beekman, Bleeker and Mulderij (1983) suggest are the important elements of language as it is used in context. These elements can then be used to provide clarity of meanings to the language used by participants when presenting their stories. Sparkes present the view that through language and the use of language in portraying stories
people are constructing their own personal identities. It is then through these stories and identities that they attempt to assemble and ascribe meaning to their experiences (Sparkes, 2005) presenting a representation of their ‘lifeworld’.

As an inexperienced phenomenologist I considered that the use of structured methods of data analysis provided a useful guide to focus analysis, whilst remaining true to the transcendental element of the phenomenological process. With this in mind Colaizzi’s framework was used to guide the data analysis process (Colaizzi, 1978). Colaizzi, a psychologist who used Husserl’s work as an inspiration in developing his analytical framework (Thomas 2005; Litchfield and Chater, 2007) is considered to have developed a descriptive phenomenological approach to data analysis (Connelly, 2010, p.128). The seven steps of phenomenological analysis developed and presented by Colaizzi are presented in Table 4.3.

Table 4.3: Colaizzi’s seven steps of phenomenological analysis (Colaizzi, 1978)

<table>
<thead>
<tr>
<th>Colaizzi's Seven Steps of Phenomenological Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The researcher reviews the collected data and becomes familiar with it. Through this process they gain a feeling for the subject’s inherent meanings.</td>
</tr>
<tr>
<td>2. The researcher returns to the data and focuses on those aspects that are seen as most important to the phenomena being studied. From the data they extract significant statements.</td>
</tr>
<tr>
<td>3. The researcher takes each significant statement and formulates meaning in the context of the subject’s own terms.</td>
</tr>
<tr>
<td>4. The meanings from a number of interviews are grouped or organised in a cluster of themes. This step reveals common patterns or trends in the data.</td>
</tr>
<tr>
<td>5. A detailed, analytical description is compiled of the subject’s feelings and ideas on each theme.</td>
</tr>
<tr>
<td>6. The researcher identifies the fundamental structure for each exhaustive description.</td>
</tr>
<tr>
<td>7. The findings are taken back to the subjects who check to see if the researcher has omitted anything.</td>
</tr>
</tbody>
</table>

Each of these seven steps is discussed in greater detail in relation to the data analysis undertaken.
4.7.1 Step one: familiarisation with data

Step one is where familiarization of the data begins. I read and re-read the interview transcripts whilst listening to the tapes in order to be submerged in the data and allows for what Colaizzi terms as ‘making sense of the data’ (Colaizzi, 1978). I listened to each interview tape to revisit the contents. Once familiar with the verbal contents of the tapes, I replayed the tapes at the same time as reading the transcripts, adding in information from the field notes and non-verbal elements where relevant.

4.7.2 Step two: extraction of significant statements

At this stage, interview transcripts were revisited; this time with the specific purpose of extracting what are termed ‘significant statements’. In addition, repetitions within transcripts were removed. Drew suggests that the passages in a transcript stand out to the researcher because the researcher can identify with them. They signify ‘inherent personal meaningfulness’ because of our involvement with them (Drew, 2001). At this stage I revisited information I had bracketed (Appendix 9) to ensure that I was not ‘unbracketing’ my preconceptions or influencing how significant statements were identified.

4.7.3 Step three: formulated meanings

Here ‘significant statements’ were transformed into ‘formulated meanings’; a process Colaizzi refers to as ‘creative insight’ where the leap is made between what is said and what is meant (Colaizzi, 1978). This is a form of linguistic analysis in which language is treated as a system within the analytic process (Barua, 2007). The importance here is to gain meaning from the language used
by participants to express their experience (Loren, Ton, Bleeker and Mulderij, 2002). An example of a significant statement and its conversion to a formulated meaning is presented below. In interview one whilst talking about his post operative recovery from recent surgery, one participant stated,

“…he umm extracted more fluid, a bit more fluid, and said that he thought I had an infection…."

Patient 7- male

The meaning given to this significant statement related to how the patient presented the situation that he was experiencing. In this instance he expressed that he was now considered by the doctor to be ‘infected’. As such the formulated meaning I ascribed to this description was ‘labelled as infected’. Figure 4.2 shows a diagrammatic representation of the transformation of another example of significant statement (verbatim text) into a formulated meaning.

---

**Fig.4.2: Example of the transition from verbatim text to Formulated Meaning**

```
“Only two operations I have had an infection and the only two operations where I have had a catheter fitted”.
```

```
Having a catheter fitted is presented by the individual, as being the causative factor in developing an infection post surgery
```

```
Significant event
```

---
This process of transforming significant statements into formulated meanings was undertaken with all the 88 significant statements identified from the interviews conducted. This resulted in 67 separate formulated meanings.

**4.7.4 Step four: meanings clustered into themes**

Here the formulated meanings were grouped together into theme clusters. This involved a similar process to step three, but with greater emphasis on ensuring that meanings were not lost or overlooked in the aggregation process. All formulated meanings generated from the data were reviewed and those meanings that expressed similar connotations were aggregated into an overarching theme. There were 67 formulated meanings identified. Figure 4.3 provides an illustration of 23 of the 67 formulated meanings generated and how they were aggregated into representative themes. Colour coding has been used in this representation to provide a visual aid to group identification.

The thought processes used to move formulated meaning units from the individual units into themes was discussed with my clinical supervisor. This was carried out for a number of purposes. Firstly to help externalise thought processes and ensure transparency. Secondly, to ensure ‘unbracketing’ had not occurred during the data analysis processes. Finally, it was a way of seeking agreement, between the data as formulated meaning units and its transference into collective themes.
Formulated meanings

- Symptoms and then treatment led patient to believe they had an infection
- Good care
- Even though considered developed an infection, overall experience was considered good.
- Cleanliness as caring
- Understanding why surgery was necessary eased process
- Positive care
- Significant event
- Potential diagnosis latched onto by patient
- Not receiving medical attention whilst in hospital led to an expression of isolation.
- Healthcare professionals continually changing their mind about how they are going to treat. Going back and forth between different doctors
- This uncertainty about different doctors think is his treatment plan, pt is losing faith in service
- Differing opinion from another doctor leads to expressions of frustration
- Being treated as pt expected someone with an infection to be treated led them to believe they were infected
- Symptoms and previous experiences led to a belief that same situation was occurring again
- Changing opinion with different healthcare professionals/ conflicting information
- Dread as experiences are repeated
- Unanswered questions
- Unwanted / unvalued
- Cleanliness as part of the caring environment
- Feeling he was ignored, not considered important
- Loss of control of events within recovery
- Legitimate worry
- Fear for the future

Theme

Pendulum of care
Perception of infection
Yo Yoing
Vulnerability
Significant event

Figure 4.3: Diagrammatic representation of 23 of the 67 formulated meaning aggregated into five themes generated

Themes generated from the formulated meanings were taken back to the relevant transcribed interviews to ensure that they were accounted for within the text. Colaizzi presents this as a form of theme validation (Colaizzi, 1978).

4.7.5 Step five: descriptions of themes

It is at step five that the exhaustive description, a description that encompasses all of the elements within each theme, is composed from the integration of themes. Themes were expanded to encompass the meaning behind the theme
name. Information contained within the significant statements and formulated meanings were used to fully describe what the theme represented in terms of a comprehensive, description of elements contained within the theme. Full outlines of the exhaustive descriptions are presented in section 4.9. There were 14 sub-themes identified from the 67 formulated meanings. It is at the end of this stage that all the sub themes, within the main themes, are brought together in the exhaustive descriptions.

4.7.6 Step six: identification of fundamental structures

From the exhaustive description, emergence of the essence of the phenomena is presented; the essential structure of the phenomena. The important element within this phase is presenting the data in such a way that someone, who has not experienced the phenomenon, can appreciate what it means for someone who has (Thorne, 2000). At this stage the ‘intentionality’ of the experience is analysed and are presented as descriptions which portray the essences of the phenomenon presented (the concept of which is presented in section 4.4.1). To ensure that only true essences were extracted from the descriptions of the phenomenon, rather than incidental findings, a technique presented as ‘free imaginative variation’ was used. This technique requires the addition or subtraction of elements within the presented essence. If the essence is altered by these changes then it is argued that the essence no longer represents the phenomenon under investigation, if however, changed elements do not alter the structure of the essence then they are incidental (Priest, 2003; Heath, 2000).
Boeree (1998) presents a useful analogy that helps to explain this free imaginative variation in relative terms. He presents the essence of a triangle. A triangle by definition has three sides, the addition of another side changes the shape such that it is no longer a triangle, thereby altering one of its essential components (i.e., triangles always have three sides). If however the colour of the triangle was changed it would still be a triangle thereby making the colour incidental to the essence of what constitutes a triangle (Boeree, 1998). The process of free imaginative variation was used throughout the data analysis process. An example of how free imaginative variation was applied is presented, using data generated during the patient interviews. When patients presented their experiences of surgical site infection they mentioned that doctors or nurses, they had clinical encounters with, led them to believe they were infected, either by the way they treated them or the terminology they used when speaking to them. Here contained within this description are three elements; the patient, the doctor or nurse and the interaction. Using the principles of free imaginative variation, would altering one of these components change the essence of the description? If so that element is an essential component of the description of the phenomena. For example if I were to change the doctor or nurse to say a neighbour or friend would it alter the nature of the experience? Or if I were to remove the interaction would it alter the essential component of the experience. In this instance the answer would be yes, because it is the credibility that the patient gives to the views of the doctor or nurse and their interaction with the patient that resulted in them to believe they were infected.
Any formulated meanings, generated from significant statements, that had the potential to have more than one meaning were explored using imaginative variation techniques. Extract of verbatim texts were returned to their place within the whole transcripts to ensure that the meaning(s) derived truly represented the context of the experience as it was presented. Presentation of these descriptions and components were achieved with the use of verbatim transcripts which contained the unaltered expressions and perceptions of the individuals who have experienced surgical site infection.

4.7.7 Step seven: validation of findings

Step seven involves validation of the data with the participants themselves. Colaizzi presents this as returning the descriptive results to participants to see how they compare with their experiences (Colaizzi, 1978). Summaries of the descriptive themes were returned to a random selection of patients to ensure a true reflection of experiences had been achieved. Controversy surrounding participant validation of data generated from interviews continues to be debated in the literature. Giorgi (2008) suggests that participant validation is flawed on several accounts. Firstly, analysis should be performed in a phenomenological attitude and it cannot be assumed that participants are aware of these processes. Secondly, findings are loaded from a disciplinary perspective and that expertise is required to understand results. In contrast however, Walter argues that the role of a researcher, using Husserlian phenomenological methods, requires confirmation that what the researcher says reflects a true representation of the experience. The only way this can be achieved is by seeking agreement from those who experienced it (Walters, 1995). After consulting with my academic supervisors, I decided to seek patient validation;
firstly because this step is inherent in Colaizzi’s method of data analysis used within this study, and secondly, I decided that offering patients the opportunity ‘see’ their experience in my findings would, in my opinion, offer some validation to the findings. Four randomly chosen patients (patient interviews 1, 4, 7 and 9) were sent a copy of the themes identified from their interview for the purposes of validation. Each patient was asked to comment as to whether the findings presented offered a true representation of their experiences. All four transcripts were returned and no further amendments to the findings were made by the patients involved. However one patient did comment that he had not appreciated that:

‘So much information could have come from what I said’

4.8 Reflexivity

As well as the bracketing of preconceived ideas, a reflective diary was maintained throughout data collection and analysis. During data analysis feelings that arose or internal inquiries were recorded in the reflective diary. An example covered in my reflective diary related to the formulated meanings of ‘legitimate worry’ or ‘significant event’ that arose from the significant statements identified. I originally termed this ‘causative factor’, as I considered it was what the patient saw as the cause of their infection. However on reflection I felt I was making an assumption, not so much about what the patient was saying, but more about the clinical factors associated with the development/causes of wound infections. I identified, through further reflection, that although these events had occurred and the patient may have felt this was a cause of their infection, the term legitimate worry or the fact that to the individual it was a
‘significant event’ better represented what the patient was presenting in their story.

Finally, notes were made in the reflective diary on comparisons regarding interpretations of data and information contained within my bracketed data; regarding my previous knowledge and experiences relating to all aspect of patient care. This was to ensure my preconceptions were not influencing data analysis, but also as a means of externalising the analytic and decision making processes as they arose to present an audit trail throughout the data analysis process. The reflective diary was also used in the reintegration process of ‘unbracketing’ data so that it can be reinvested back into the investigation as a whole (as presented in section 4.5.3.1)

4.9 Findings
The findings presented here were generated from the analysis of the nine interviews from patients who self-reported a surgical site infection, and who agreed to share their experience. Section 4.10 describes the key findings, supported by narrative text, the complete narrative summaries are contained in Appendix 12. Presented below in Figure 4.4 is a diagrammatic representation summarising the data analysis process.
Although not part of the five themes emerging from the data, it is interesting to note that after the initial interview question below, each patient started describing their unique experience from different stages of their hospital journey.
“Please describe in your own words your experience of going into hospital for your total knee/hip replacement surgery. Then following on from sharing this experience, having left hospital can you share your postoperative recovery at home, is that OK?”

One patient started their description from the time it was decided surgery was necessary; two patients whilst waiting for surgery; three at the pre-assessment clinic; two on admission for surgery and one patient after the surgery on return to the ward from the operating theatre.

Five major themes emerged from the data analysis. These themes do not appear as isolated entities, but as a collective whole reflecting the total patient experience. The findings are presented to reflect the Husserlian concept of horizontalisation, inherent within Husserlian descriptive phenomenology. Horizontalisation, refers to how the findings are presented, ensuring that each description or essence of the phenomena presented is as important as the one that precedes or follows it. Keeping within this principle no one theme generated is of more importance than another. As such the order in which the themes are presented here is not intended to show the significance of one theme above the other.

The inclusion of verbatim quotes of some of the significant statements is used to show the reader some of the context contained within each theme. Chenail (1995) suggests that the juxtaposition of data extracts alongside descriptions of the themes is important in producing quality presentations that can assist the reader in judging the trustworthiness of the data presented. These verbatim
examples will be placed within quotation marks using bold text. The verbatim quotes used have been selected to best illustrate the richest data presented in each theme. Each verbatim quote presented is annotated to identify which patient interview it represented. In addition, where relevant, dotted lines have been used at the beginning and end of the quotation when the text preceding or succeeding the quote was not relevant to the description. The words presented in italics are the formulated meanings applied during the labelling of the significant statements that provide additional meaning to the categories presented.

4.10 Themes

Five themes emerged from the data. Labels given to these five themes were created as a representation of the theme content. These themes were; Vulnerability, Perception of infection, Significant event, ‘Yo Yoing’ and Pendulum of care. Figure 4.5 shows a diagrammatic representation of the interconnection between the themes identified.

![Diagram](Image)

**Figure 4.5: Five emergent themes with arrows identifying interconnection between themes**
Each of the components presented in Figure 4.5 are not viewed as isolated entities that occur at single time points within the patient journey but instead represent elements that span the continuum of the patient experience. The presentation of each of these themes in 4.10.1-4.10.5 will be followed by a discussion relating to the content of that theme. The discussion incorporates the reintegration phase of the bracketing process where bracketed data is reinvested back into the findings.

Remaining with the Husserlian phenomenological method, and remaining true to the concept of horizontalisation, themes generated are not presented in an order intended to represent a hierarchical structure. Vulnerability is the first theme to be presented.

4.10.1 Theme: Vulnerability

According to an online encyclopaedia vulnerability is a concept that links the relationship of an individual to their environment (Wikipedia, 2012). Within the context of the data presented across the interview transcripts, the representation of vulnerability has been constituted by seven sub-themes namely; loss of control, fear, despair/dread, benchmarking progress, fretting, isolation and burden.

4.10.1.1 Sub theme: Loss of control

This loss of control and inability to cope was presented in the transcripts; influencing both physical as well as psychological abilities. The inability to control events appears to contribute to a sense of uncertainty for the individual
One patient felt as though they were ‘trapped’ in the hospital. For them this represented a loss of control over what was happening to them. This patient could see the nice weather outside, considered it to be ‘the best few weeks of the year’ weather wise and all she was able to do was wander around the hospital ward waiting for the next dose of antibiotics.

Another patient represented the loss of control they felt in relation to what was happening to them physically. In this instance the patient had been at home for several days when he stood up to move and all of a sudden fluid appeared to ‘gush’ out of his wound. He could not control the flow or understand what it was that was happening to him. He needed to call assistance from the district nurse to help him control the situation.

The significant statement presented below represents one patient’s loss of control over managing their pain, but how working with his doctor he was trying to gain some of the control back.

“Went in to see my doctor, and asked if they could somehow adjust my medication so that most of it was at night. Because during the day as somethings were going on and moving it didn’t tend to hurt so much, but at night it was absolute murder”

Patient 6- male
The feelings that the situation, and outcome of events, were out of control was presented by two thirds of the participant’s interviews. In one interview six formulated meanings representing loss of control were generated from the significant statements contained within that one particular interview.

4.10.1.2 Sub theme: Fear

Fear is a distressing, unpleasant emotional state that can arise out of exposure to danger, or expectation of pain (Fowler and Fowler, 1997). The element of fear expressed within the interviews usually concerned fears for the future. A patient’s struggle to currently manage was then projected into fears of what the future held for them. None of the patients’ transcripts presented any positivity. Some patients predicting negative outcomes, expressed fear of an unresolved infection or fears relating to how they would cope long term if their recovery did not improve.

“I don’t know how I am going to manage with a gammy left knee and this one unstable. I just don’t know”

Patient 6- male

4.10.1.3 Sub theme: Despair/ dread

The term despair and dread conjures up a view of hopelessness, anticipation about the fear of what is to come. The link with previous subcategories within this theme supports the notion presented of despair. This is presented as a feeling of things going wrong and knowing that they are wrong and there is nothing that can be done to change the ‘here and now’ of the situation.
One patient, who had previously had an infection, and was coming back into hospital with what he perceived to be another infection, used words such as ‘nightmare’ to express the dread he felt about what was happening to him.

“...never had a night’s sleep since I came out of the hospital. I can get no, I can find no position comfortable where I could put my knee. I was up most of the night”

Patient 6- male

This man’s previous experience in which an earlier infection had taken four to five months to be treated left him despairing about whether he would cope with having to go through a potentially similar experience again.

4.10.1.4 Sub theme: Benchmarking progress

It appears, from some of the experiences presented, that patient uncertainty about their progress and loss of function manifests itself in comparison to others who underwent the same surgical procedure progress at the same time. Patients appeared to benchmark their progress, and when they found themselves falling behind, they considered their post surgical recovery to be deficient.

“Yes I began to notice the patients in (ward name) are getting better and better and better and I am getting worse and worse and worse”

Patient 1-male

When comparing himself to others, the patient attributed his infection to holding back his progress, as no one else had an infection and they all appeared to be recovering as expected.
“...I don't think anybody else said we've got an infection as well, I was the only one and er that was what caused me and set me back quite a lot”

Patient 1- male

4.10.1.5 Sub theme: Fretting

Within the characteristics of human nature is the ability to fret, which is to be nervous, anxious or worry. Depending on individual's personal make up the anxiety levels generated by negative experiences can manifest themselves in different ways. Here words like ‘frantic' were used to describe the worry felt by participants about what was happening to them.

“....apparently whatever the count is was high, in the blood test which came back so they admitted me, err into the ward. At this stage I was getting a little frantic.”  

Patient 8- male

The way in which one patient was treated by the nurse at the Doctor’s surgery led her to worry about what was going on with her wound, when previous to this appointment the patient had not be overtly concerned.

“...and then I did get alarmed because when I went to my GP surgery again with the clip removers. The nurse says ‘oh no’ she said ‘I am going to get the doctor to look at this' so she went and got Doctor..... He comes along and pats me on the shoulder and said ‘straight back to the hospital’”

Patient 4- female

The comments by the nurse led her to believe something was wrong, the doctor then confirmed something was wrong by suggesting the patient needed to return to hospital. However neither the doctor or the nurse explained to the patient what they felt was wrong. She was left to fret about whether she was
experiencing a minor or major complication with her wound healing and whether there would need to be further treatment required.

Another element represented within the sub theme of fretting related to how the patient was recovering functionally. They were worried that ‘something had gone wrong with the knee’, previously they had been able to undertake a good range of movement and over a period of time this was reducing. Patients worried about whether or not they had done/were doing enough themselves to try and improve their current situation with regard to the declining mobility of the joint in the long term.

“ In the last few days or so…..I felt that something may have gone wrong with the knee because umm if I stand up now I can’t get the leg straight, I think maybe I haven’t exercised enough and maybe the leg is seizing up but it tends to give way”

Patient 5- male

Implied within this sub theme is the element of how the future, whether near or distant, looks. Within sub theme 4.10.1.3 despair and dread, the representation is about what is happening to them at that time and how that makes them feel. In this sub theme of fretting it is concerned with how the patients views the experience over time. The repeated visits to the doctor (presented by the transcript from patient 4) where everything appeared to go well, only to find it wasn’t led to worrying about what this meant for the future is just one example.

4.10.1.6 Sub theme: Isolation

This was presented in terms of both functional and geographical isolation. The term functional isolation describes an experience that did not mean that they
were alone or separated but that they felt ‘out of it’ in terms of their interaction with others in the outside world and their progress as a whole.

“I did feel very trapped when I was in hospital”

Patient 9- female

Another form of isolation presented within one of the interviews was that of geographical isolation; because they were placed in a general surgical ward, not the orthopaedic ward, due to bed pressures the medical team on the ward looking after them knew nothing about the expected plan of care. As such the individual felt isolated from the orthopaedic team in terms of how his infection was to be managed and what the plan of care was for him.

“......so I felt a bit isolated, yeah”

Patient 7- male

4.10.1.7 Sub theme: Burden

The reduced mobility and inability to cope left some patients feeling that they were a burden to others because they were not independent or that they might become a burden to others if events continued to progress to a negative outcome.

“.....the way I am at the moment I might be a nuisance”

Patient 1- male

In summary the sub themes of vulnerability provide an important overview of the theme. An important aspect of this theme, vulnerability, is that it is not one of the elements presented here that on its own constitutes the theme. It is the individual elements brought together that represent the sense of vulnerability experienced by the patients. This theme could be considered in the context of creating a cocktail. In your drinks cabinet you have Vermouth, Campari and
soda water. Each of these items are considered individual drinks on their own, however, if you mix these three ingredients together you can create a different drink, namely an Americano cocktail. The same can be considered in terms of how this theme, represented by the term vulnerability, has been constructed. Each of the emotions named within this theme namely, loss of control, fear, despair/dread, benchmarking, fretting, isolation and burden, exist as single entities, however when mixed together, in what-ever combination, they create a collective experience, in this instance I have represented it by the term vulnerability.

4.10.1.8 Discussion of vulnerability

In healthcare, the term vulnerability has various meanings depending on the context in which it is considered (Plomp and Ballast, 2010). In psychological terms vulnerability is often considered in association with depression and when inadequate coping mechanisms exist (Sinclair and Wallston, 1999). Where as a low social economic status, poor health and high unemployment represent vulnerability within a public health domain framework (Galea, Aherna & Karpati, 2005). Scanlon and Lee examined the literature relating to the concept of vulnerability for patients in an acute care setting. They present three main themes relating to vulnerability: social vulnerability, psychological and physical vulnerability (Scanlon and Lee, 2007). In this study, it could be argued that the “vulnerability” linked to surgical site infection appears to constitutes two of these themes, namely psychological and physical vulnerability. The psychological vulnerability was expressed in terms of the emotions represented within the transcripts, despair, fear, fretting and isolation.
Scott, in a review of the literature around anxiety in pre-operative information for intensive care patients, presents the anxiety felt by hospitalised patients as relating to the fear of the unknown, and the resultant physiological effects of anxiety can impact on individual’s recovery (Scott, 2004). Jawaid, Mushtaq, Mukhtar and Khan (2007), in their study exploring preoperative anxiety in Pakistan found that 87% of patients reported a fear of complications from their surgery as the cause of their anxiety. In this study individuals were undergoing hospitalisation for major surgery, an experience alone that can cause increased fear, anxiety and uncertainty regarding the surgical procedure and what the experience will be like (Gammon, 1998). This fear and anxiety can be influenced by events that occur prior to surgery.

Every day patients will read the “media hype” (McLaughlin et al, 2008) around the ‘rise of the super bug’ and current affairs programs dramatising the incidence of MRSA within hospitals does little to adequately prepare the general public to the realities of healthcare associated infections. Another influence contributing to fear arises when patients attending prior to elective surgery are ‘screened’ for MRSA before coming into hospital. Media stories, together with screening for MRSA may all contribute to increasing anxiety for patients fearful of developing an infection prior to hospital admission for elective surgery. The introduction of pre-surgical screening for MRSA arose as part of a government initiative, with the aim being to reduce the incidence of hospital associated infections. Patients are not often aware of local or government policy in relation to healthcare provision and acts such as pre-operative screening can be interpreted by patients in differing ways. Some patients may take the inference that the hospital must have a problem to be screening everyone, others that
they may not receive treatment if found to be positive. These factors can all increase the worry that patients may feel before coming into hospital for a surgical procedure. Locally, patient information sheets, detailing the MRSA screening process, why it is done and what it may mean for individual patients is given out during the pre-assessment appointment when routine MRSA screening is undertaken. It is intended that this information will assist patients to understand why this screening is undertaken and how it benefits them as patients.

When the lived experience encompasses the development of a surgical site infection this represents the physical aspect of vulnerability. This appears to be compounded by the mixed messages and conflicting or even incomplete information given to patients by healthcare professionals. Anxiety has already placed additional demands on an individual, these demands compete for time and attention from the individual affecting their ability to take in information or deal with information as it is given to them (Gammon, 1998). Patients become reliant on healthcare professionals for information, none the more so when an infection has been suspected, about their ongoing care, treatment and prognosis. It would appear that a combination of poor information together with the patient’s reduced inability to retain or interpret this information, leads to increased worry, uncertainty, and a fear for their future in terms of their recovery from surgery. The vulnerability the individual presents relates not just to the near future in terms of how they will manage during the infection, but also appears to negatively influence how they view their ability to manage in the long term. Their belief that they will not be able to function normally is a cause for concern and worry and leaves them feeling vulnerable about their future.
These are not emotions that a person should normally experience every day or normally for extended periods of time. They should normally be transient emotions, at, for example times of stress such as: exams or the death of a relative. It could be argued that all patient are anxious prior to hospital admission, whether this be for planned elective surgery or as a result of hospitalisation following sudden significant illness. However as the transcripts show these negative emotions are common features of their lived experience, and as these patients have reported a surgical site infection, they are part of that specific lived experience. So when individuals develop a surgical site infection, the resulting heightened emotions they experience cause what has been interpreted as vulnerability.

Besides the emotional elements of despair, fear, worry and isolation, presented in the transcripts within the theme of vulnerability, there were experiences that re-enforced the emotions they were experiencing. Section 4.7.1 demonstrates how elements of the experiences that the patients interviewed had such as benchmarking, loss of control and the experience of feeling a burden to others impacted on their vulnerability.

With relation to the experience of benchmarking, three main elements warrant discussion. Firstly, what some of the transcripts showed is that participants benchmarked their progress to where they were prior to surgery, secondly, where they felt they should be, in terms of their recovery, and finally the comparison to others at the same stage in the postoperative recovery. The unfavourable comparisons, those participants who self-reported an infection,
had between themselves and others recovering from similar surgery may have caused them to worry more about their progress. This worry may have led them to feel despair and despondency regarding their future progress. This comparison of outcomes, made by the patients interviewed, may have increased their feeling that they were losing control of what was happening to them in terms of their functional ability post surgery. This may have also led them to feel that they may be a burden to others if their functional ability did not improve sufficiently for them to manage independently.

Individual participants placed themselves in the hands of healthcare professionals, they trust them to look after them and care for them. In doing so they lose the control they normally have within their lives, as they are subjected to hospital protocols and procedures during their inpatient stay. Within the lived experience, presented in the transcripts of those self-reporting the development of an infection, this trust is challenged as patients are told a variety of differing information in relation to how their care is to be managed. The information they did receive often changed quite considerably and was sometimes contradictory depending on which healthcare professional they saw at any given time. As the trust the patient places in the healthcare system is challenged so the patient’s vulnerability increases.

4.10.2 Theme: Perception of infection

Another theme identified across the findings was that of Perception of infection. Perception of infection was influenced by several differing factors; previous knowledge/experiences of infection, the symptoms of infection and the
subsequent treatments and “labels” applied by healthcare professionals. These factors are presented below as sub-themes.

4.10.2.1 Sub-theme: previous knowledge/ experience of infection

Repetition of previous experiences seemed to act as a form of re-enforcement. Having previously had an infection following a surgical procedure and now finding themselves experiencing similar symptoms, the patient felt more confident in identifying a potential problem, confidence reaffirmed when the doctors confirms this suspicion

“....having had a post op infection before I knew this wasn't right (laugh) so I immediately went over to my err doctors.......he took one look at it, felt it and took my temperature and said ‘yes you have something wrong’”

Patient 8- male

Pattern recognition played an important part in providing the explanation for what the patient was experiencing. Four of the nine interview participants presented some form of previous experience or knowledge relating to how they believed infected patients would be treated. In this instance it is about not being told they definitely had an infection, but having had previous similar treatment, they knew that an infection was suspected before it was confirmed This they then used to guide their belief that they had developed an infection (because they were being treated in the same way).

There appears to be a relationship between preconceived ideas about how someone with an infection would be treated and how they were treated. When they were treated, as they would expect someone with an infection to be
treated, they then made an assumption that they were infected based on this preconception. Here they appear to have called upon knowledge based on previous experiences to influence their understanding on what is happening to them. The extract of the transcript presented below shows an example of how one interviewee felt, because of the way in which the healthcare professionals interacted with them; although not confirmed, they assumed that they must have developed an infection.

Interviewee: I was feeling fine actually. Umm it was just annoying that I had got this infection.
Interviewer: and did they tell you you had an infection? Did they say or was that your understanding?
Interviewee: that was my understanding

Patient 9- female

“...yes, because obviously they couldn’t let you out until the infection gone, that the sort of thing I heard”

Patient 9- female

One patient labelled himself as infected based on the symptoms he felt. The assumption was made, in his description, that he had what a healthcare practitioner would describe as an infection.

“I got what you would call it a post op infection but it wasn’t on the wound. It was over the whole knee erm it was very swollen, very very hot”

Patient 3- male

Inherent to this experience was the need to make sense of what had happened to them so that it can be rationalised and meaning attributed to what was being experienced. An example shared by one patient relates to them ‘being kept’ in hospital longer than others who had been operated on at the same time. They
then made an assumption that they had an infection, due to this increased length of stay. A separate example was when a patient was secluded and moved into a single room of their own. The perception was that they were being isolated and must therefore have an infection.

4.10.2.2 Sub theme: symptoms/ treatment of infection

This sub category was dichotomous in nature; in that patient’s views represented opposite poles of the same spectrum. In this context it was the difference between the symptoms they expected to experience if they had an infection and what they were actually experiencing. The rationale that if they had an infection they must feel ‘unwell’ caused disparity when in fact they did not feel unwell and so therefore, in their view, could not have had an infection. One participant represented such a view. She was told she had an infection, but did not feel unwell, so therefore she felt that she could not be infected.

“…. I don’t know what kind of infection it was. I can’t believe it was anything too serious because I would have felt poorly.”

Patient 4- female

Three participants presented an opposing view to that presented above. As they had symptoms (which through their previous experience/knowledge base were related, by them, to having an infection) they thought, therefore, that they must have an infection, even though this was not necessarily the case.

“I felt a bit fluey…. Yeah I felt achy in my joints and a little bit fluey so I knew something wasn’t right”

Patient 3- male
“I must have had an infection straight away because it literally started the next day. With yellow fluid coming out..... I had some antibiotics.....some antibiotics every six hours
Patient 9- female

4.10.2.3 Sub theme: interaction with healthcare professionals

It would appear that there was an essential element of labelling by healthcare professionals. Patients believed that healthcare professionals told them that they ‘maybe infected’, that they possibly had a ‘slight infection’, however at this point in their recovery quite often a definitive diagnosis of infection had not been determined. The patient had however latched onto this label and presented this ‘potential’ infection as a definite outcome of their surgery throughout their story.

“....they got the doctor down from the hospital quickly, and he had a look and he said ‘ah yes ‘. He said you have picked up an infection”
Patient 1- male

“....and err eventually I thought there is something wrong here so I did, I went to um the health centre and I saw the nurse there and she took me in and er said yeah you've got an infection in there”
Patient 2- male

“...he extracted more fluid, a bit more fluid, and said he thought I had an infection”
Patient 7- male

Within two thirds of the participants’ stories it appeared that the participants adopted the labels that were applied/inferred by healthcare professionals. Such labelling often occurred in interactions where the label is used by healthcare practitioners, both in primary and secondary care, and the interaction only occurred over only a few minutes. What might seem an “off the cuff” comment by the healthcare professional appears to have long lasting connotations for the
individual and subsequently how they perceived the outcome of their experience.

4.10.2.4 Discussion of perception of infection

It appears that three components were deemed to constitute what influences an individual to consider they have a surgical site infection. These three components manifest themselves in terms of the individual’s previous knowledge or experience, the symptoms they experienced and were influenced by the interaction healthcare professionals had with the patient.

Previous knowledge can be gained from a variety of sources within everyday life experiences. Individuals gain knowledge regarding infections from open access sources such as television, newspapers and the internet as well as previous experiences involving healthcare services (Gill, Kumar, Todd and Wiskin, 2006) The outbreak of infections and the rise of the ‘super bugs’ presented in the media, nationally and locally, may present the individual with a limited amount of information that they ‘latch on to’, to form their knowledge base. The fact that this information may have been dramatised to attract interest and may not be factually accurate or explanatory in nature is not necessarily considered by the individual. This form of ‘historical knowledge’ may then be called upon as a means of explaining events when they come into hospital.

The experience presented by those self-reporting a surgical site infection within this study provided definite views about what they considered the signs and symptoms were of an infection. Some of this had been gained from previous experiences in which they had developed infection, and so when similar
symptoms presented they made a comparison and a judgement. This study did not explore in detail what these signs and symptoms were specifically.

Of interest in the findings is the belief, by some participants, that because they felt well they could not have an infection. The differences between a systemic infection, affecting the whole body, and localised infection, involving the surgical site, do not appear to be differentiated by participants and, as such, the belief that they would feel unwell, if they had an infection, governs their overarching belief that they cannot have an infection. Whether this view was based on previous knowledge or, from previous personal experience, was not made explicit based on the information contained within the transcripts.

When the perceived signs and symptoms of infection occur, the patient seeks clinical review with a healthcare professional, someone who they believe can; clinically assess, evaluate their symptoms, plan the appropriate care and reassure them. However, in this study the lived experience of some of these patients shared revealed that when the healthcare professionals, although not necessarily undertaking a full clinical review, suggested to patients they may have a ‘slight infection’ or ‘maybe infected’, did nothing to reassure them.

4.10.3 Theme: Significant event

The next major theme identified from the findings was that of Significant Event. The element of this theme can be demonstrated by the represented formulated meaning of a ‘legitimate worry’. This is an event that occurred during their hospital stay that the individual has perceived as the cause of their subsequent infection. The relevance of, or confirmation that, the event did cause the
infection is not considered by the individual in terms of whether it was possible for this event to have caused their infection. Whilst patients may not necessarily have the clinical knowledge about how infections develop or, the causative factors for infection, they form an opinion on the cause of their infection based on these assumptions. The individual believed that this event, an act that was done to them, caused the infection to develop. This significant event or ‘legitimate worry’ was represented in four of the nine interviews. Incidences presented within the individuals’ stories are different for each individual.

Presented are:

- Accidental early drain removal
- The use of a urinary catheter
- Problems during the operative procedure they believe occurred
- Legitimate concerns raised by nurses not being heeded by the junior doctors.

“…only two operations I have had an infection and the only two operations where I have had a catheter fitted.”

Patient 8- male

“I started to shake. I was really cold, really cold. I heard him say ‘his temperature is normal 37.4°’ and I heard ‘so for god’s sake will you keep him still because the table is very narrow.’ I heard him say something like’ I will give him a drop of the old pethidine’ and then I was out of it. I came too in the recovery room covered in a heated blanket, it was warming me up. I was just so cold. I said to them’ how many bits of stuff have I got hanging out of me now then?’ and um the guy said to me ‘only your catheter’. So I said ‘what happened to the drain then?’ and he said ‘it fell out when they transferred you from the operating table to the trolley’”

Patient 6- male

“…the drain pipe that comes out of the wound to keep things running whilst they are operating, I believe it is supposed to come out within three seconds or so from the operation coming out. Somebody must have left it there for three minutes and that’s where lots of infection got in.”

Patient 1- male
What cannot be determined, after the event, is the significance of these events in relation to the actual development of infection. There is the possibility that these ‘significant events’ played a part in the development of the infection, however throughout the story none of the participants presented a rationale or confirmatory evidence given by a healthcare professional as to whether the cause of infection was known.

4.10.3.1 Discussion of significant event

In summary, four of the nine participants interviewed identified an event within the post-operative recovery which they felt had some influence on them developing an infection. Why they view the ‘event’ as the significant factor in their ‘getting’ an infection may be influenced by the information they receive prior to attending for their surgical procedure.

These patients went through a pre-assessment process, whereby they are prepared for their surgery, in terms of the fitness for surgery but also in relation to what surgery entails and what to expect during their inpatient stay. From this information patients may create an expectation of how their surgery and subsequent recovery is ‘supposed’ to play out. However what is expressed in the patient’s story when their recovery does not travel the expected path, such as when an infection develops, is the patient’s need to validate why their recovery has deviated from the expected pathway. It appears from the transcripts that they explore and reflect on their experience to try to ‘explain’ or rationalise why they may have developed an infection. An example of this presented in one of the transcripts relates to one participant who quite clearly
felt that the fact that his wound drain had ‘fallen out’ in recovery before it was
supposed to was what caused his infection to develop. Although the individual
was ‘blaming’ this occurrence for causing his infection, it appeared that this
brought some sort comfort in the terms of an explanation for why the infection
occurred. As stated previously the clinical significance of this, or other
‘significant events’ or ‘legitimate worries’ as actually being the cause of the
infection cannot be confirmed.

4.10.4 Theme: Yo Yoing

The fourth major theme identified is that of Yo Yoing. This theme’s title was
derived from the description of the individual's experience. It is a symbolic
representation of the patient’s journey moving backwards and forwards between
hospital outpatient clinics and doctor’s surgeries. This metaphor conjures the
image of backwards and forwards movement represented by the motion of a yo
yo. (A yo yo is a toy that consists of a flattened spool wound with string that is
spun down from and reeled up to the hand by motions of the wrist.)

Patients rarely saw the same healthcare professional from one visit to the next,
and felt they received different, and sometimes conflicting, information at each
visit. This type of experience is best expressed by some of the significant
statements presented below.

“.....umm he then said ‘I am not convinced that you had an infection’ so
err how you are going to tell me? I said ‘people are telling me I've had an
infection. You’re saying you're not convinced. What? Somebody there
must be a way of knowing whether or not I've got an infection surely?’”

Patient 6- male
The descriptive accounts above appear to be due to the conflicting information between different healthcare professionals and between previous and subsequent diagnosis and treatment plans. The variety of healthcare professionals participants saw left them bewildered as to what was the ‘true reality’ of what they were being told. Contained within this experience, is the belief that when they see a healthcare professional they are seeing an expert and from this they should be getting expert advice; however contrary to expectations, it appears that ‘all’ the ‘experts’ are saying something different. The Yo yoing is an abstract concept, the link between some of the themes. It was this yo yoing backwards and forwards that increased the vulnerability individuals felt and, as a consequence, increased and reinforced the view that the care they were receiving was ‘poor care’

4.10.4.1 Discussion on Yo yoing

Yo yoing a theme representing ‘motion’ or ‘movement’ encapsulates the stories presented in relation to the contradictory information received from individual healthcare professionals seen as part of their care and treatment. In this study, many individuals being treated for infection appear to have seen a number of hospital doctors, General Practitioners, hospital and community nurses, with different levels of experience, all potentially saying something different to the one seen before. This is portrayed in the extract from one interview in which the

“....went to see my doctor again because I was getting rather concerned with it. She again rung the hospital (again having previously been told to start antibiotics by the hospital) somebody in the hospital said ‘oh no you shouldn’t have treated Mr …., you should have sent him straight up here’”

Patient 3- male
individual showed frustration. Having seen a doctor in the emergency department who told him he had an infection, being readmitted and seen by a different doctor who told him he did not have an infection. The patient then was at a loss. Being told different information by different doctors resulted in considerable anxiety, anger and frustration.

This ‘movement’ between healthcare professionals was not only presented in terms of the hospital inpatient process but also in terms of the communication between primary care and secondary care. When patients were discharged from hospital they were returned back into the care of their General Practitioner. However, in this study, the lived experience presented by those developing problems post discharge showed that the information being given to General Practitioners, seeking assistance on how to treat the patient, varied depending on who they spoke to within the hospital system. An example of this is presented in section 4.10.4 and represents the patient witnessing the General Practitioner receiving different advice for the same problem in two separate consultations. This conflicting advice does little to either assist the General Practitioner in caring appropriately for their patient, or reassure the patient that they are receiving the most appropriate treatment. It would appear that the experience patients have of ‘yo yoing’ backwards and forwards acts as the momentum that moves the pendulum of care.

4.10.5 Theme: Pendulum of care

The final theme from the findings is that of Pendulum of care. Perception of the quality of the care received swung from good care through to bad care. I gave this experience of care the descriptor of ‘pendulum of care’ and two
components were identified with respect to care in general, more particularly the two end points of the pendulum swing between positive care and negative care. There are represented in two sub-themes as follows:

1. Caring Environment
2. The care givers and the experience of care

The reason this category was termed ‘pendulum of care’ rather than caring, is that the term caring has positive connotations, whereas in this category both positive and negative elements are expressed. The emotions related to care received seemed to swing backward and forward depending on how the individuals perceived the care they received and their satisfaction with the outcomes of surgery. Whilst things were going well, as an inpatient in the hospital, care was perceived as good. However when they were discharged home and problems developed, their perception about how their surgery had progressed changed, they way they represented the care they received changed from a positive to a negative viewpoint.

4.10.5.1 Sub theme: caring environment

This sub theme relates to care received in relation to the environment. The stories presented relate to individuals that perceived they had developed an infection. Yet the important environmental elements that they presented in the interviews were that of a clean and safe environment in which they were looked after. There were a number of significant statements that exalted the efforts that cleaners and support care staff put into ensuring that the wards were clean and tidy.
“I can only compliment everybody in the hospital in every manner the cleanliness of the hospital; the staff of the hospital, the attendants, everything was to perfection.”

Patient 5- male

“The cleanliness was really terrific and the cleanliness of the actual ward um I have no complaints what so ever, just accolades.”

Patient 3- male

“......they were absolutely brilliant the nurses, they were completely cleanly. Cleanliness was fantastic”

Patient 9- female

Of interest to note in this study is that at this stage of their journey through the hospital system, even though these three participants present themselves as having developed an infection, they do not present the situation, or apportion blame to the ward environment. Patients discussed the hospital ward environment in some detail, suggesting it was a major component of their experience. The ward is the main environment in which patients received care and also where potentially an infection could develop. However the stories would suggest that they saw the ward as an environment that met high standards. By implication the ward was not considered or presented as the cause of their infection. No reference was made to other areas where care may have been delivered such as the outpatient department or General Practitioner’s surgery.

4.10.5.2 Sub theme: care givers and the experience of care

Data presented within the interviews relates to the care provided by both professional and non-professional healthcare providers who interacted with them throughout their stay in hospital. Initially, many extensively presented
positive aspect of care and only changed to present negative connotations further along in their story, when things ‘appeared’ to go wrong with their recovery

Seven of the nine interviewees shared, within the context of their stories a positive experience of the care they received.

“I was very impressed with everything. From the Consultant down to the cleaners, they were all such kind people.”

Patient 4- female

Kindness here was presented as caring. In being shown kindness the participants felt they were being well cared for. Alongside the term kindness other terms such as ‘humane’, ‘attention’ and ‘caring’ were used to portray how individuals felt they were treated.

“....well it was the attention and the staff itself were humane and they were very understanding and very attentive all the time”

Patient 1- male

“The nurses were absolutely brilliant and they looked after me the whole time.”

Patient 9- female

“.....so overall I was looked after extremely well. I was informed at all times you know and kept in comfort, it was absolutely brilliant.”

Patient 9- female

of the nine individuals felt valued by those providing the care to them, again an important point when considering these participants were experiencing what could be considered a negative outcome of their recent hospital experience.
However, after their recovery appeared to deviate from the normal expected pathway, it would appear the pendulum swung from ‘good’ to ‘bad’ care. They expressed a ‘loss of trust’ in the care they received, subsequent to the development of the infection. The way they were ‘handled’ by healthcare professionals left them feeling ‘devalued’ and ‘unimportant’.

Two of the participants expressed, elements that represent that they felt they were the ‘unwanted patient’. This can best be represented by the following quotes from the analysed transcripts.

“......so they just kept me there as long as they had to and got rid of me.”  
Patient 1- male

“I am also concerned that I am getting offloaded out of the system and forgotten about”  
Patient 6- male

4.10.5.3 Discussion of Pendulum of care

Of interest, when considering the pendulum of care, are the patients’ perceptions regarding cleanliness. Cleanliness is of central importance to the patients in relation to their care. Hospital cleanliness has been in the public arena through current affairs programmes and news reports. In December 2005 the BBC reported on the outcome of the Healthcare Commissions unannounced visit into 98 hospitals, which found that two thirds of Hospitals (NHS and Private hospitals) were failing to meet recommended standards of cleanliness (BBC News Channel, 2005). Patients are aware of these programs.
One third of those interviewed, discussed as part of their experience, that they felt the hospital was clean. Of importance here is that although these individuals perceived they have developed an infection, they believe they were cared for in an environment that in no way contributed to causing an infection. Hospital hygiene did not contribute to the momentum of the pendulum.

When the lived experience changed from “not being infected” to being “infected”, the view of individual care received appeared to change; often a change from a good “care” experience to a bad “care” experience ‘swinging’ from a positive stance to a negative stance as infection was identified and interaction with different healthcare professionals ensued.

At the beginning of their care participants represented their care as being delivered by staff that were humane, showed kindness, comfort and support. However, the analyses of the interviews present change - as their recovery deviated from the expected path of recovery. The lived experience of these individuals then changed to one where the care provided left them feeling ‘devalued’, ‘unimportant’, and ‘unwanted’. Participants represented this as a ‘loss of trust’ in the care they received.

So what happened during the patient journey that led to this change of view? This study found that the patients receiving information communicated in a variety of differing styles, to give a differing set of information left them “confused” and “unsure”. This poor communication does not reflect well on doctors, nurses and other allied healthcare professionals. Clinical management pathways exist to support clinicians in managing this patient group, advocating
evidence based practices. The fact that infection only occurs in a small percentage should not detract from the need for extra vigilance - about adhering to designated pathways - when suspicion (even if not later confirmed) arises. If this essential communication between healthcare practitioners and patients was managed more effectively then perhaps the pendulum of care would have been more appropriately managed and the patient (albeit still on a challenging curve) would not have felt so isolated and in limbo. The communication aspects however are not just in relation to the healthcare professional talking to the patient. It also involves the healthcare professional talking to the other appropriate healthcare professional to ensure the patient is carried along that conversational journey during that process of communication. Lack of appropriate and decisive communication between healthcare professionals appears to the patient as though they are on an uncontrolled swing of the pendulum.

The next section provides a summary of the emergent themes and their interaction with each other. Following on from this is the description of the essence of the phenomena as described and how this fits within Husserl’s view of intentionality.

### 4.11 Summary of findings

In summarising the findings Figure 4.6 provides a visual aid to understanding how the emergent themes are linked and relate to each other.
Using Figure 4.6, the lived experience of developing a post operative wound infection, for the ‘infected patient’, is expressed in terms of how they perceive their infection in relation to themselves and their situation. The **significant event** appears to be the preliminary factor, the beginning of the chain of events.

Subsequently as the **perception of infection** increases the patient’s state of **vulnerability** which changes from a state of low vulnerability (at the start of their journey) to high vulnerability (when infection requires further ongoing management including; repeat visits to hospital or readmission, antibiotic drug therapies, and a delayed recovery). At the same time, it appears that the

---

Figure 4.6: Diagrammatic representation of the links between the emergent themes of significant event, vulnerability, pendulum of care and perception of infection.
positive view they had of the care they received can change to a more negative care experience following infection. These movements, from low to high vulnerability and positive to negative care, appear to have been influenced by the ‘yo yoing’ backwards and forwards between different healthcare professionals. The continually changing information and management plans received from the different healthcare professionals contributes to this increase in vulnerability and the change in the perception of the care they received, swings the pendulum of care.

Husserlian phenomenology is concerned with identifying the essences and descriptions of an individual’s ‘lifeworld’ as presented within their ‘natural attitude’ of the phenomena under investigation. Having identified the themes and the related descriptions of these patients’ experience, the essence of the experience of surgical site infection has been presented. In order to identify the ‘intentionality’ associated with the phenomena one further stage is required. As presented previously (discussed in section 4.4.2) contained within the Husserl’s notion of ‘intentionality’ are the two concepts of ‘noema’ and ‘noesis’. Personal internal debate ensued at this stage of the process as the essences (themes and descriptions) were manipulated to ‘see’ if they were represented within the concept of the experience (the noema) or related to the way in which it was experienced (the noesis).

In order to make the split between noema and noesis explicit the theme that encompassed the description of vulnerability needed to be sub divided into physical and psychological vulnerability (as discussed in section 4.10.1.8). Within physical vulnerability sits the notion of benchmarking, where physical
limitations are measured against others without infection; and secondly isolation as in this instance it is presented in terms of physical/ geographical location. With this separation made the noema (the experience itself) can be represented by the physical vulnerability presented, their perception of having an infection and the significant event they experienced. These are all concrete aspects (and as such represent an experience) and relate to the experience of having a surgical site infection. The noesis (the way in which it was experienced) in this case is reflected by the themes representing yo yoing, psychological vulnerability and the pendulum of care are related to what these patients experienced due to their having an infection. However these entities, the noema and noesis are connected and when one alters, the other alters correspondently and as the individual’s ‘natural attitude’ changes, with time and experience so will the noema and noesis of a phenomena (Russell, 2006).

Having presented a description of the lived experience of surgical site infection, the next section explores the measures employed to ensure trustworthiness of the data presented.

4.12 Evaluation of qualitative methodology used

Due to the nature of qualitative research, being an interpretive rather than a technical task the use of critical appraisal checklists have been debated in the literature and in general found lacking, because of their protocol driven approach to evaluation (Greenhalgh, 2006). However Greenhalgh does recommend possible ‘ground rules’ that could be followed when evaluating qualitative studies (Greenhalgh 2006). Guba and Lincoln (1989) present criteria
for evaluating qualitative research that could be used as ‘ground rules’ for evaluating qualitative research. These criteria are presented in terms of evaluating the trustworthiness of the study. Trustworthiness, in relation to qualitative research, includes issues that relate to credibility, transferability, dependability and confirmability. Several methods of improving overall trustworthiness of the study were utilised.

4.12.1 Credibility

Credibility, the extent to which the study measures what it is intended to have been enhanced by several factors in this study. The use of descriptive phenomenology as a means to explore the lived experience of phenomena is a well recognised approach for inductively exploring phenomena. Credibility was also enhanced through the use of participant checking. Shenton (2004) presents this an important aspect of any study’s credibility, in ensuring that the researcher’s representation gives a true reflection of the meanings as presented through the words and stories of those interviewed.

Analysed transcripts were returned to participants for validation. Analysed interview transcripts (with the formulated meaning generated from the significant statements) were sent to four participants who were chosen at random to confirm whether the results presented were ‘credible’ in so much as they presented a true representation of their experience. There is always the potential that participant’s stories may change with time and asking them to revisit the same event at a later date may alter their perception of what occurred (Ferrari, 2006). However returned analyses did not yield any changes to the data as it was presented.
Another strategy that enhanced credibility related to the discussion around the decisions behind placement of the formulated meanings into themed groups with a clinical and academic supervisor and acted as a means of verbalising thought processes. Verbalising thought processes in relation to the allocation of formulated meanings into themes also provided a method of ensuring that preconceptions were not ‘unbracketed’ with the potential to influence the findings.

4.12.2 Transferability

Transferability relates to how effectively the results presented here could be transferred to other similar situations. This study was exploring the lived experience of self-reported surgical site infection. Each of the patients interviewed in this study had experienced the phenomena under investigation. The purposeful sample means that each patient was representing a real experience for them. The sample of patients interviewed in this study also reflected similar demographics to those undergoing similar surgery throughout the United Kingdom, and so are representative of the general population, increasing the potential transferability of the results.

It is not always easy to consider issues of transferability within qualitative work as the research questions and sample populations are small and relate to specific phenomena under investigation. However Nicholls (2009) suggests that in qualitative research it is the theories generated not the specific data that are transferable. However Giorgi (2008) suggests that phenomenological data, arrived at using phenomenological reduction is transferable, according to
Husserl, as essences are themselves generalisable. The sample used for this descriptive phenomenological investigation provides a basis for transferability.

4.12.3 Dependability
Dependability of the research findings can be problematic in qualitative research, as the changing nature of phenomena under investigation can make replication difficult to achieve (Shenton, 2004). Shenton suggests that a detailed presentation of how the study was conducted goes some way to support dependability by allowing others to repeat the same research process. To enhance dependability of this study detailed methods were presented that related to interview technique/schedule and in-depth presentation of how data analysis was undertaken. To support the process of data analysis Colaizzi’s method of data analysis was undertaken. The verbatim transcriptions of all of the interviews resulted in approximately 66 pages of data to be analysed. The use of a formalised data analysis process assisted in providing structure and guidance when contemplating how to undertake the analysis of the data generated whilst remaining within a phenomenological stance.

4.12.4 Confirmability
Confirmability relates to the impact the researcher has on the research being undertaken (Shenton, 2004). In this instance it is about showing how researcher bias has been reduced. In this context reflexivity is a means of showing confirmability.

Reflexivity, and the way it relates to phenomenological enquiry is associated with the way in which the data was collected, received and analysed
In terms of qualitative research reflexivity refers to the way in which the researcher acknowledges their potential influencing biases and how these are dealt with (Jootun, McGhee and Marland, 2008). Descriptive phenomenological methods that follow Husserl’s approach require, as part of the research process, an acknowledgement of the researcher’s preconceptions.

To acknowledge my personal biases I undertook a personal reflection analysis to consider influence, bias and perceptions following 20 years experiences of caring for patients with infection following joint replacement surgery. I explored this firstly, from the context of my clinical knowledge (regarding how infections develop and subsequently identified) and tried to recall both recent and historical episodes of my personal interaction with the care of patients with infection following joint replacement surgery. These reflections were formalised into written format and constituted the beginning of the reflective diary used throughout the research process. This process highlighted that I had made assumptions about the pain, reduced mobility and fears regarding the need for further surgery, and how, after the onset of infection, the patient-doctor relationship appeared to breakdown. These preconceptions were then ‘bracketed’ and metaphorically placed to one side while the research was undertaken. This bracketing process was undertaken (and the results presented in Appendix 9) to act as an aid to enhance reflexivity within the research process. Preconceptions that were bracketed before commencing the research process (and contained within the reflective diary) were revisited prior to conducting and analysing transcripts of the interviews to reduce the potential for inadvertent ‘un-bracketing’ throughout the research process. The reflective diary acted as an “aide memoire” by highlighting areas I needed to remain open to
minimise "closure" or biases. This diary also contained reflections regarding the interview process, additional information gained following individual interviews and discussions in the work environment that related to this study. Using the reflective diary in this way assisted me in exploring my interview technique. For example, I noticed areas in initial interviews where I seemed to only provide friendly reassurance when patients presented accounts of their experience instead of incorporating a slight pause for participants to gather thoughts. After listening to these initial interviews, I decided to modify my interview technique and attempted to be bold and probe gently, but a little deeper to some of their responses. Early identification of issues such as this allowed me to continually evolve my interview technique as the research progressed.

Chapter Four, Phase Two of this study, has presented the phenomenological investigation into the lived experience of surgical site infection. The rationale for choosing Husserlian phenomenology to explore the lived experience of surgical site infection has been explored. Methods of data collection, data analysis and the subsequent findings have been presented. These findings have been discussed, and how the themes discussed represent what Husserl terms the ‘noema’ and ‘noesis’ of the experience.

In Chapter Five a discussion of the findings from both Phase One and Phase Two of this study will be presented and placed within the context of current healthcare provision and relevant literature. Limitations of the research undertaken together with implications for future practice and areas for on-going research within this organisation and within healthcare organisations nationally are also discussed.
CHAPTER 5: DISCUSSION

5.1 Introduction

The findings of Phase One and Phase Two of this study are discussed in section 3.5 and 4.10. It is now appropriate to place these findings in context within the national surveillance data and then discuss the implications on future practice. It is also appropriate to outline how the themes, developed from the individual patient’s journey, might influence and direct the development of future management plans.

5.2 Surgical site infection: surveillance

In order to improve our understanding of surgical site infection a tool is required that can be used to collect surveillance data after the patient has been discharged from hospital. This project used postal questionnaires as the means of surveillance. Postal questionnaires as are relatively inexpensive to develop and administer (Denscombe, 2003). Questionnaires sent out as part of this study yielded an 88.5% response rate. This appears to be better than response rates obtained in two other UK studies, using postal questionnaires, performed by Mishriki, Law, and Jeffery (1993) and Noel, Hollyoak and Galloway (1997) (both exploring post discharge surgical site surveillance in general surgical patients) which showed a 79% and 76% response rate respectively. Other studies have utilised telephone survey methods to collect post operative surgical site infection surveillance to yield higher response rates, in one study the rate was 92% (Holmes, and Readman, 1994). Recently however when our infection control team undertook a similar initiative locally, it had to be stopped
following patient complaints about intrusion. At a time when there are increased demands on post-operative patients from government departments to complete and return national outcome data to measure and improve clinical quality measures following surgery it was felt that additional telephone contact by local healthcare professionals requesting even more information may be unacceptable, especially if they were not experiencing problems.

5.2.1 Surveillance period

National NSSISS data uses a 30 day cut off period for the identification of surgical site infection. This research study has identified that the majority (82%, n=19) of infections identified had developed within the 30 day period, with nine percent (n=2) developing between 30 and 47 days (nine percent of patients did not report a time frame in which their infection developed n=2; section 3.3.3, Table 3.6). This would suggest that the current use of 30 days as a ‘national’ defining point for surgical site infection is appropriate to identify the majority of surgical site infections for these procedures. Despite the majority of cases having been identified within the 30-day period, there are infections that are not being accounted for and, one infection, undetected and inappropriately treated can be a burden for both patient and healthcare system. Robust measures are needed to ensure that infections that develop after this 30-day period are still identified and managed in a timely and effective way.

5.2.2 Surveillance data

The Nosocomial Surgical Site Infection Surveillance Service (NSSISS) currently reports surgical site surveillance data that relates to infections identified during the inpatient stay and for those readmitted within 30 days of surgery. The study
reported here aimed to address the gap in current surveillance data by including the whole 30-day period. Thus identifying patients developing infection post discharge not readmitted to hospital but instead were either treated in primary care or in the hospital outpatient setting. Figure 5.1 highlights the major difference between current national surveillance methods and the surveillance methods used in Phase One of the study presented (the group circled highlights the group of patients not identified by NSSISS)

![Diagram](image)

**Figure 5.1: Identifying the difference between current national surveillance methods and surveillance methods utilised in Phase One of the study presented (difference circled).**

Figure 5.2 highlights the actual numbers of patients that would have been identified by the respective surveillance methods. The NSSISS data are extrapolated using the known inpatient duration and those subsequently identified. This data are presented with the number of patients identified at each phase of the surveillance.
Figure 5.2 illustrates that using the current NSSISS methods, of reporting inpatient and readmission within 30 days, 13 patients would have been identified within this organisation. Locally extending surveillance to incorporate the whole 30 day period, a further ten infections might have been identified.

5.3 Infection rates: locally extrapolated from national surveillance data

Conversely the NSSISS data regarding the incidence of surgical site infection (following either total hip or total knee replacement) sent to this organisation from the Health Protection Agency indicated that for the same surveillance period no infections were identified (for the 12 month period) (HPA, 2011a: HPA, 2011b). However, using the NSSISS protocol, and including consecutive data collected over a one year period an infection rate on 2.9% was identified (the 13 patients whose infections were identified during inpatient stay or due to readmission). When this surveillance was then extended to include the whole 30 day period (including infections identified post discharge and not readmitted) an infection rate of 5.1% was identified. Three main reasons are identified for
this difference in reported infection rates. Firstly, data submitted to the Health Protection Agency used to compile the surgical site surveillance data is only submitted for a three-month period within each year (representing one quarter). This means that infections that developed outside this quarter are not included in the figures that are used to represent the annual infection rate. Secondly, as mentioned previously the data capture was expanded to include the post discharge patients not readmitted to hospital, and who would not normally be included in the figures. Thirdly, data presented as part of this study represents patient reported surgical site infection. Inherent to the issue of patients self reporting infection is the potential that patients over report the incidence of surgical site infection either by misdiagnosis or by misconception on their part (based on patient’s beliefs rather than specified clinical signs and symptoms).

5.3.1 Wounds

There are difficulties in defining surgical wound infections. A systematic review of the measurement and monitoring of adverse surgical events found that there is no single objective test and that, defining surgical site infection relies on subjective assessment (Bruce et al, 2001). This makes comparisons between the incidences of surgical site infection in the published literature difficult because not all authors used the same criteria for defining infection. The difficulties, in defining surgical site infection, can arise for several reasons:

- Wounds can show signs of infection (purulence, swelling and erythema) but no bacteria isolated on culture (Bruce et al, 2001).
- Cultures can be positive when there are no symptoms of infection (Bruce et al, 2001).
• Difficulty exists between distinguishing inflammation of a wound from infection of a wound (Gaine et al, 2000).

In order to address some of the difficulties associated with identifying and defining wound infections, the Centre for Disease Control (CDC) developed definitions of surgical site infection (Horan et al, 1992). These definitions form the basis of the National Nosocomial Surgical Site Infection Surveillance Service protocol. Bruce et al, (2001) recommend that the CDC definitions be used in all surgical site infection surveillance, especially if valid comparisons are to be made between different studies. The questionnaire developed as part of this research study incorporated the CDC definitions of wound characteristics in order to maintain consistency between the post discharge surveillance data and that routinely during in patient stay as part of the national surveillance data.

5.4 Financial Implications

Figure 5.2 shows that a further ten surgical site infections were identified by surveillance that included the whole 30 day period, in which patients developing infections may be treated in primary care or in the hospital outpatient setting. So if the additional infections (n=10) identified through the surveillance methods utilised in Phase One of the study reported here (not currently identified and therefore potentially not treated) were to go on to develop significant infection, this may have serious financial implications. Early diagnosis, within four weeks of surgery, can potentially mean the difference between salvage of the prosthesis and significant surgery involving washout of the infected prosthesis and potentially a two-stage revision (Gardedian, Sternheim and Backstein 2011). This four week period is important because it is during this time that
biofilms are formed. The susceptibility of the biofilm to antibiotic treatment depends on the molecular make up of the biofilm (Samuel and Gould, 2009). The longer the organism remains in contact with the implant the greater the potential to generate antibiotic resistance (Childs, 2008) Therefore the sooner the infection and infecting organism is identified and treated the greater chance of successful resolution of the infection without the necessity for further surgical intervention.

The approximate cost per patient of undertaking a surgical debridement and washout procedure of an infected knee is approximately £6,000 per patient. If salvaging the implant is not possible and revision surgery is required the estimated cost then exceeds £10,000 per patient. These costs do not include additional requirements incorporated by extended length of stay (over seven days) and the added cost of long term intravenous antibiotic therapy required as part of their treatment. Phase One and Phase Two of this study identified a variety of management pathways individuals experienced, which may have resulted in delays before receiving appropriate treatment. This may have resulted in delays to healing and the necessity for more invasive and expensive treatment regimes in order to achieve successful treatment of the infection. Taking aside the personal impact to the individual (which will be discussed later), in terms of healthcare costs these potential extra surgeries and treatments represents a significant financial healthcare expenditure. However the cost of surveillance mechanisms to identify these potential infections is significantly lower, involving methods of identifying patients to be surveyed, administration of a postal questionnaire and data inputting costs.
5.5 Management of acute infection

In the study reported here the management of patients self reporting surgical site infection has been explored, both in terms of process, in Phase One, and in terms of the patient experience in Phase Two. Issues were identified in both Phases of the study in relation to the way in which patients self reporting surgical site infection were managed. Firstly the issues relating to the processes involved, when managing this patient group, and secondly the issues relating to the patient experience regarding their management will be discussed.

5.5.1 Management process

Phase One, of the study presented, has identified two failings in the management process of patients with suspected joint infections:

- Firstly, poor adherence to local and national management pathways by clinicians in primary and secondary care
- Secondly, the lack of clinical information on microbiology specimens potentially affecting the way in which these specimens are dealt with by the microbiology department.

Nationally and locally there are recommended management pathways for patients who having undergone joint replacement surgery and who develop a suspected surgical site infection. The recommended management pathways (section 2.7.4) outline specific diagnostic and treatment recommendations when infection is suspected in a patient with a prosthetic joint. Moran et al, (2010) algorithm outlines the process of managing the patient who has a clinical diagnosis of prosthetic joint infection, whilst Mathews et al, (2009) present an algorithm that outlines the appropriate management if a prosthetic joint infection
is suspected. Mathews et al (2009) suggest that a red hot swollen joint that has a reduced range of movement, increasing pain and wound discharge (provided the patient is clinically stable) should initially have baseline bloods for inflammatory markers, blood cultures and x-rays to assess for joint loosening. Then joints should be aspirated under aseptic conditions and samples sent to microbiology. Whilst the local management pathways (Appendix 6) were developed with the sole aim of ensuring that patients who have had a prosthetic joint, and presented with suspected wound infection, were referred onto specialist practitioners for their management.

There were a number of deviations from local policy, no referral to specialist practitioner (n=11/23), joint aspiration/joint fluid collected (n=3), failure to provide adequate information on specimen collection (n=6/6).

Specialisation (within a specific clinical field) would suggest there is an added interest and knowledge within this field, motivating the practitioner to remain abreast of current practices, policies and guidelines. Betsch et al (2008) identified that patients with prosthetic joint infections, treated according to recommended management algorithms, was associated with significantly better outcomes. Referral to practitioners with specialised knowledge and expertise relating to joint replacement surgery means that patients presenting with potential infections following this type of surgery would receive evidence based management. Knowledge of current clinical management pathways should ensure that relevant investigations are undertaken to ensure appropriate treatment regimes are commenced.
Joint aspiration is recommended to confirm infecting organism and assist in management of these individual cases. However, from the information collected on the questionnaires it was evident that out of the six individuals who had microbiological specimens taken (n=6) only three of these were joint fluid. Although all patients who had microbiological specimens taken were commenced on antibiotic therapy by the practitioner they saw, what cannot be determined at this stage, (based on the information supplied in the questionnaire alone), is whether joint aspiration was clinically indicated for individual cases. This was because not all these individual patients were reviewed by specialist practitioners following recognised management guidelines.

Poor clinical information placed on the microbiology request forms could limit the investigations that technicians receiving these specimens undertake. In all but one case, laboratory technicians would not have known that these patients had recently undergone joint replacement surgery. This has major implications, in that normally when a specimen has been identified as having been taken from a patient with a prosthetic joint replacement, the specimen is treated differently. Guidelines on the processing of microbiology specimens from patients with prosthetic joints, state the specimen is cultured as normal for 24 hour period as well as being cultured in an enrichment culture for a further 5 days to see if any organisms are identified (Health Protection Agency 2009). If organisms are identified they are then tested for sensitivity to antibiotics, so that advice can be given about appropriate antibiotic therapy. This is not necessarily the same for routine microbiology specimens from general surgical wounds. However from the six specimens taken antibiotic sensitivities were only
identified in two of the five specimens in which organisms were grown, this may have been due to the inappropriate labelling of specimens.

Further exploration is required to understand why these processes failed and what needs to be done to prevent these failures from reoccurring in the future. Decisions regarding who should oversee the management process of this patient pathway, so that services are monitored and managed effectively, may need to be held between appropriate personnel in individual healthcare organisations.

5.6 Patient experience

Phase Two explored the patient experience of surgical site infection following joint replacement surgery. Phase Two of this study, a phenomenological investigation, explored the lived experience of patients who self-reported developing a surgical site infection within six weeks following either a total hip or total knee replacement. This study used Husserlian descriptive phenomenology, a qualitative philosophical approach to data collection and analysis to guide the research method. Participants were interviewed on an individual basis, and asked to present their story.

The findings from this study reveal that the way the patient is managed and the way they interact with healthcare professionals impacts negatively on their lived experience. There is little published literature that specifically explores the lived experiences of patients with surgical site infection following joint replacement surgery. However, where possible, literature from other clinical disciplines will be used to draw comparisons.
Previous studies exploring the patient experience of infection has focused on patients with MRSA infections that have required isolation. Explorations of the patient experience in relation to an MRSA infection relate to information about what a patient understands of MRSA, the issue of isolation, the stigma attached to being infected and the treatment regimes (Madeo 2001; MacDonald 2008; Criddle and Potter 2006). However these were not areas that were identified within the patient experience for the patient group in this study, who although self-reporting surgical site infection, were not necessarily infected with MRSA. The focus of research around infection relating specifically to MRSA has mainly been on the impact of isolation during the inpatient stay rather than the post discharge period (Madeo 2001; Knowles 1993; Barratt et al, 2011).

Donaldson et al, (2007) presents previous research that shows that patients develop a personal representation of their illness based on several interrelated components. These components are; **identity**- the label of illness and associated symptoms, **cause**- personal ideas of the cause of their infection, **time line**- perceived duration of illness, **consequences**– severity of illness and impact on functioning, **control care**- belief about outcome and recovery. Similarities exist between these components and the emergent themes presented in Phase Two of this study. Table 5.2 compares the similarities between the components of a personal representation of illness and the emergent themes of this study.
Using Figure 5.3 it can be seen that patient reports of the lived experience of surgical site infection, presented by patients in this study, shows similarities with the personal representation of patient’s illness as presented by Donaldson et al, (2007). The study presented here identified that, in relation to developing a surgical site infection, patients perceived they had an infection based on their knowledge of infection, the symptoms they experienced and the labels they were given by healthcare professionals, representing an ‘identity’ to their illness. Consequently once a patient’s ‘identity’ is that of infection they need to present a cause for the infection. In this instance it was labelled a ‘significant event’. The perceived duration of illness (timeline), the severity and impact on functioning (consequences) and the belief about their recovery (control care) are all represented within the emergent theme of vulnerability. The two remaining themes from the study presented here of ‘yo yoing’ and ‘pendulum of care’ are not part of the personal representation of illness discussed by Donaldson et al, (2007), but, are factors that influence (yo yoing) or are the result of (pendulum of care) how that ‘illness’ is managed.
5.6.1 Vulnerability

Vulnerability, as an emergent theme, contains three components of the patient’s personal representation of illness (as presented by Donaldson et al, 2007) namely; time line, consequences and control care. Purdy’s (2004) concept analysis of vulnerability, suggests terms such as; susceptible, open to attack, liable to harm, exposed, as some of the defining attributes of vulnerability. A comparison could be drawn between the elements contained within the theme of vulnerability, in the study presented here, and the concept of vulnerability as described by Purdy. In this study patient’s reporting surgical site infection, because of what they were experiencing, expressed feelings of worry, despair and fear for their future in terms of functional outcomes.

5.6.2 Perception of infection

As shown in Figure 5.3 Donaldson et al (2007) representation of an individuals illness contains a component referred to as ‘identity’. Similarities exist between this component and elements within the emergent theme of perception of infection. According to Weinman, Petrie, Moss-Morris and Horne (1996) this ‘identity’ component, of a personal representation of illness, relates to the patient’s ideas about the link between the label and the nature of their illness. In this instance the experience presented by the individual patient’s stories show that they used their previous knowledge and experiences, the symptoms they were experiencing and their interaction with healthcare professionals, to attach an ‘identity’ to their experience. The ‘identity’ in this instance was one of infection.
5.6.3 Significant event

Donaldson et al (2007) portray in the introduction to their study (exploring patients perceptions of osteomyelitis, septic arthritis and prosthetic joint infections in relation to the psychological influence of MRSA) the components that constitute a personal representation of illness. Within this representation is the individuals' need to find a cause for their illness. The study presented highlighted that patients identified a 'significant' event within their recovery and that this 'event' was believed to be the cause of their infection. Weinman et al (1996) suggest that health psychologists have shown that in order to deal with the effects of illness individuals need to create a representation of their 'illness'. Contained within this representation is the need to identify a cause for their illness. Within the study presented here the cause of their illness bears comparison to the emergent theme of 'significant event'. As patients' identified an event within their experience that they consider to be the cause of their infection they are fulfilling that element of their personal representation.

5.6.4 Yo yoing

A large part of the lived experience of developing surgical site infection involved the inter-relationship, between the vulnerability a patient experienced and the impact ‘yo yoing’ between healthcare professionals had on the care they received. The continually changing management plans and the lack of consistency between healthcare professionals appeared to increase a patient’s vulnerability. Several studies have explored patient journeys and stories as a means to improve the quality of care provided (Berendsen, Majjella de Jong, Meyboom-de Jong, Dekker & Schuling, 2009; Gullick and Shimadry 2008; Madeo 2001). Identification of poor communication between healthcare
professionals, a lack of consistency in management of care has been shown by Gullick and Shimadry (2008) to cause increased anxiety, distress, and feelings of abandonment. Berendsen et al (2009) study exploring the transition of care (from primary to secondary care in the Netherlands) supports the findings of the study presented here and highlights the negative impact on patients of receiving conflicting information from different healthcare practitioners.

5.6.5 Pendulum of care

The story presented by the individual participants represented a care experience that swung from positive to negative; in relation to the care they received (represented in the theme as ‘pendulum of care’). However in this instance, and at this stage of the patient recovery, the pendulum has only ‘swung’ one way. Perceptions about the NHS and the care individuals using the service received appear to vary depending on whether they were treated with or without incident. All the time their treatment and recovery was progressing ‘as expected’ they present a positive view about the care they received. However as problems start to develop and they deviate from the expected pathway, the way participants appeared to view the care they received swung to represent a negative viewpoint.

This negative viewpoint about their care appears to stem from the poor interaction they have with healthcare professionals. The failing element within this interaction appears to be communication. Communication in this instance relates not only to communication between practitioners in primary and secondary care but also between the patient and the healthcare practitioner. Adherence to the management pathways may have gone some way to improve
one element of this ‘poor’ communication (the practitioner to practitioner
element), as both primary and secondary healthcare practitioners would be
channelling all patients with suspected infections to one central point where
they would receive their care. However the second element of patient to
practitioner communication is much more complex in nature. The analysed
transcripts presented patients as having a communication experience which left
them ‘confused’ and ‘unsure’ about their what was to be their planned treatment
of care. What cannot be grasped from this study is what essential features were
missing from the communication that would have improved the experience.
During the time period that this data was collected the Orthopaedic department
received 8 separate concerns/complaints specifically relating to communication
issues. There are already initiatives in place locally aimed at improving
communication between healthcare professionals and patients (‘Let’s Show We
Care’ campaign and the ‘Being Open’ policy both of which were launched in
2011). Good doctor patient communication makes a difference, in terms of
satisfaction as well as outcomes (Rao, Anderson, Inui & Frankel, 2007).
Charles, Gafni and Whelan (2000) suggest that doctors and patients use
different ‘voices’ when communicating. The medical ‘voice’ using a
reductionist biomedical model and the patient ‘voice’ using subjective
experience of illness as they relate it to their world. This dissonance between
the two different types of ‘voices’ used appears to create this disharmony in the
patient’s experience of their treatment. Collins, Britten, Ruusuvuori and
Thompson (2007) would appear to recommend an approach that integrates a
balance between delivering biomedical information, (delivered in a way that
patients can understand), and dealing with the individual concerns the patient
presents is required to improve the communication process.
5.7 Personal preconceptions and the lived experience of surgical site infection

Contained within the method of Husserlian phenomenology is the concept of bracketing. The purpose and method by which bracketing is achieved have been discussed in Chapter Four (section 4.5.3.1). However it is important to discuss the bracketed data (which represent person preconceptions about the lived experience of surgical site infection) in relation to the findings of this study. (My personal reflections and preconceptions about what infection in patients with joint replacements would be are are presented in Appendix 9.)

Having presented the findings of this phenomenological investigation into the lived experience of surgical site infection following total hip or total knee replacement surgery, it is appropriate to consider how these findings correlate to the preconceptions about the experience ‘bracketed’ prior to undertaking this study. These preconceptions are a reflection of my experience of caring for patients with joint replacement infections, where repeated and prolonged inpatients stays and multiple surgeries are part of the patient experience. This study explored the lived experience of surgical site infection at six weeks following surgery and so is relatively early in their post surgical experience. Whilst preconceptions highlighted an expectation that:

- Patients look to apportion blame for their infection to the healthcare practitioners caring for them
- Experience increased pain
- Have reduced mobility
• Fear for the future regarding potential disability as a result of implant failure and revision surgery.

However the findings of this study whilst not supporting the view that patients apportion blame to the healthcare practitioners (at this early stage of their infection, before further surgery may be required), they were identifying reduced mobility and fears for the future. The extent to which these emotions were expressed was unexpected, especially in light of the potential for successful treatment and resolution of their infection at this time. The extent of these concerns and their vulnerability at this early stage in their recovery had not been fully appreciated. Gaining an understanding of the patient experience, will have a significant impact on the way in which healthcare practitioners care for this patient group in the future, especially if we are to reduce this vulnerability.

5.8 Summary

Phase One and Phase Two of the study presented explored self reported surgical site infection following joint replacement surgery. This study has highlighted the importance of evidence based management pathways (for patients with a surgical site infection following joint replacement surgery) to ensure timely, appropriate and consistent management of this patient group. This is going to become more significant as the routine follow up of post surgical patients is increasingly being transferred back into the primary care setting away from clinical specialists, where the patient’s first point of contact post surgery will be their General Practitioner.
This study presents the first in-depth description of the lived experience of surgical site infections in patients who had either a total hip or total knee replacement. It would appear that elements of how this patient group are currently managed, where care was ‘yo yoing’ between differing healthcare professionals, with different management views, left patients feeling vulnerable and with a care experience that was viewed in negative terms.

5.9 Limitations
Using a mixed methodological approach has identified several important factors relating to the surveillance and management of surgical site infections. These findings can be used as a foundation to inform practice and as a base from which future research can be planned. However, some limitations within the research process are acknowledged.

5.9.1 Island perspective
When reviewing the limitations of this study one needs to consider the geographical and demographical context. This study was undertaken in one district general hospital located on a small UK island off the south coast, the Isle of Wight, and there are therefore several factors that potentially relate to an ‘Island culture’ which need to be discussed. Namely, the population sampled and the response rates obtained. Firstly, the island population mid 2010 was estimated at 140,500 with the largest increase in the last ten years being in the 65+ year age group (Isle of Wight Council, 2012). Currently 24.13% of the population of the Isle of Wight are over the age of 65 years in comparison to 17.23% for the South East of England (Isle of Wight Council, 2012). As such the Isle of Wight population reflects a slightly older population from that of the rest
of the mainland UK. As the majority of patients undergoing joint replacement surgery are 65 years and over, the Isle of Wight potentially has a higher percentage of the population likely to undergo this type of surgery. Secondly, the response rate achieved for this study was 88.5%. The Isle of Wight population is served by one NHS Trust with one centrally located hospital, and one orthopaedic department. It may, therefore, be possible for individuals participating in this research to have had previous interaction with me (as their healthcare practitioner) or were aware that I would be responsible for their post operative follow up care. There is no way of determining if those who took part were seen by me or not but this potential familiarity may have influenced higher response rates than might have been obtained with a larger, dispersed population served by several hospital trusts and orthopaedic departments. Although response rates may be slightly higher than other studies, such as those undertaken by Mishriki, Law, and Jeffery (1993) and Noel, Hollyoak and Galloway (1997) which showed response rates of 79% and 76% respectively, the findings of this study are unlikely to have been affected by personal contact with the researcher since participants either reported an infection or not, and these reports of infection were, in 21 out of 23 reported cases, supported by clinician agreement and/or laboratory testing.

5.9.2 Phase One: cross-sectional survey

Although response rates were comparable to other UK studies there are limitations to the data collection method in terms of the time frame in which data was collected. This data was only collected over a one year period, and more substantive data collected on a continuous basis, would allow for the ongoing monitoring of surgical site infection in relation to significant alterations in clinical
practice being introduced currently throughout the NHS, such as the enhanced recovery programme. The enhanced recovery programme is about improving patient outcomes and speeding up recovery from surgery, through optimising patients prior to surgery, using less invasive anaesthetic techniques, increased post operative comfort and early mobilisation (NHS Institute for Innovation and improvements, 2012). This study identified that over half the surgical site infections reported developed post discharge from hospital. With initiatives such as the enhanced recovery programme further reducing the length of in-patient stay following surgery, evaluating the effectiveness of these initiatives, requires measurement tools that can effective collect clinical outcome data post discharge. The incidence of surgical site infection is one such clinical outcome measure. The impact on surgical site infection of initiatives such as the enhanced recovery programme can be explored through the use of postal questionnaires used post discharge.

A further limitation of the questionnaire design relate to the lack of rigour in the questionnaire design. In questionnaire development there are a number of validity checks that can be carried out to ensure that the questionnaire content reflects the identified measures; namely that of content and face validity. Content validity aims to establish whether questions are well balanced and that all aspects of the area are adequately covered (Oppenheim, 1992). Following analysis of the survey data, it was evident that some of the questions lacked detailed responses that could have enhanced the quality of the information received.

Such questionnaire changes might include:
Further details regarding what specimens were taken, how these were collected and at what time period following surgery. With more detailed information it would have been possible to identify the precise stage of post surgery specimens collection, rather than just identifying, the somewhat limited information, that a specimen had been taken or not.

Further details regarding when antibiotics had been prescribed, occurring before or after specimens could have been sought. This would have helped to identify if patient management regarding the collection of specimens prior to antibiotics consumption had followed recommended guidelines to ensure optimum identification of infecting organisms.

Further details regarding which healthcare practitioner prescribed the antibiotics could have been included. Again this would have identified whether patient’s treatment followed recommended management guidelines. Where recommended local practice had not been followed, it would have identified potential problem stages/areas within the healthcare organisation, where additional education and training, regarding the management of infections in patients with prosthetics joints may require further training/resources.

Unfortunately the initial format of the questionnaire did not ask these specific questions. The addition of these questions could have provided further understanding of how these patients are currently treated in relation to recommended management pathways.

The second aspect of validity is that of face validity. Face validity explores whether the questions appear to measure the topic(s) under review.
(Oppenheim, 1992). Although guidance from the literature on what to include in questionnaire design were sought particularly with regard to designing the layout and question generation, an additional step to increase face validity should have included piloting the questionnaire with patients and not just clinicians to provide useful feedback on question construction and content.

Finally, the data collected was that of patient reported infection and the correlation between patient reported and laboratory confirmed infections has not been explored. However Mitchell et al, (1999) in their study comparing the results of a patient reported infections against a comparative report from a clinician found that there was substantial agreement in diagnosing infection (Kappa= 0.73) (Kappa being a statistical measure of inter-rater agreement), and as such this was a reliable method of post discharge surveillance. Future studies may benefit from further exploration of the correlation between patient reported and clinically identified infection. As part of this study laboratory tests were checked to confirm whether an infecting organism was identified, however a limitation of the study was that samples were not available in all cases.

However, in this study, of the 23 patients reporting a surgical site infection 21 received antibiotic therapy prescribed by a healthcare professional, indicating that clinically the wound appeared infected. It therefore seems likely, based on the results of this study that since patient’s self-reported infections generally showed agreement with that of clinical judgement self-reported infections were accurately reported. Bruce et al (2001) identified one of the main difficulties associated with reporting of surgical site infection is that initial diagnosis is usually based on clinical judgement and that this is usually followed up with
microbiological specimens to identify infecting organisms. This is supported by
this study in which only six of the 23 reporting infection had microbiological
specimens taken, although 21 were treated with antibiotic therapy for their
infection.

5.9.3 Phase Two: Qualitative Interviews

Phase Two of the study presented has provided valuable information relating to
the patient experience of surgical site infection following either total hip or total
knee replacement surgery. This experience has not been presented previously
within the current literature exploring post operative surgical site infection.
Firstly, this study used participants who had self-reported a surgical site
infection. A limitation of the study relates to the inability to confirm that these
patients had actually experienced a ‘clinician confirmed’ surgical site infection.
However this study was exploring the lived experience of patients who self-
reported a surgical site infection. As these patients believed they had developed
an infection; their experience was that of someone who had an infection. It was
felt therefore that confirmation of infection through laboratory specimens was
not a prerequisite of inclusion within the study.

Secondly, there are limitations that relate to the research process. Within
phenomenology there is no consensus of opinion regarding how the
phenomenological method should be employed (Giorgi, 2008), and this in itself
can cause a dilemma for the novice phenomenologist. These limitations can be
further subdivided into those brought about through the researcher and those by
the research method.
With regard to limitations imposed by the researcher, this was the first phenomenological investigation I had undertaken. Although I had undertaken focus group interviews, in which interviews were recorded and transcribed, single interviews undertaken from a phenomenological stance had not been done before. For this purpose a practice interview was undertaken to explore interviewing within this phenomenological context and discussion and coaching around the interview process were sought from a supervisor. However, following analysis across all the interview transcriptions, it became evident that there were areas where more detailed understanding of the experience were missing. These relate to the signs and symptoms of infection, more in-depth description of the significant event some participants experienced and why patients did not contact the healthcare practitioner identified on their discharge paperwork. The lived experience presented individuals as identifying ‘signs and symptoms’ that led them to perceive they had developed an infection, although what participants felt these ‘signs and symptoms’ were was not explored by the interviewer. An opportunity to explore what it was about the ‘significant event’ that caused the participant to presume this was the reason for their infection was not investigated during the interviews. This information may have offered further insight into the participant’s experiences.

From the perspective of the research method, Husserlian descriptive phenomenology is a useful method to obtain the universal structure of an experience; in this case the experiences related to developing surgical site infection, when the purpose is to develop clinical interventions to help deal with these phenomena (Wojnar and Swanson, 2007). There is the issue of whether the results of this study, only utilising the interviews of nine participants, can be
transferable at all as the sample was small. However what may have enhanced the transferability of the results would have been to present the results to a selection of patients, (who developed a surgical site infection and who had not been included in this study), to see if these results represented their experiences. Comparisons cannot be made between this study and other similar studies as these do not exist within the published literature. A further limitation within this study relates to the participants themselves. There were significantly more male than female participants and two thirds of those interviewed had undergone total knee replacement surgery. This type of bias could not be controlled for in this type of study as participation was voluntary and only those patients who expressed a willingness to be interviewed could be approached to participate. However, the description of the participants involved depicted and described on page 86 enable the reader to relate the findings to his/her patients to assess whether the findings are transferable to their own setting.

5.10 Conclusions and recommendations for future practice

The study presented here has shown that the way in which the current mandatory surgical site surveillance is undertaken may potentially underestimate the incidence of this type of infection in this patient group. The type of surveillance used in this study has the potential to identify patients developing infections post discharge who were not readmitted but are treated within the primary care setting. The use of patient completed questionnaires is an economic way of collecting post discharge surgical site infection surveillance, but may not be as accurate as a clinician’s diagnosis. There still would need to be evaluative work to assess the feasibility and financial viability of instigating
more in depth surgical surveillance methods. If the surveillance methods used within this study were to be used further work would need to be undertaken to educate patients regarding what to expect from their wounds post surgery. Although one of the strengths of the results of Phase One of this study was that of the 23 patients reporting surgical site infection 21 had received antibiotic therapy prescribed by a trained healthcare professional, suggesting that healthcare practitioners agreed with patient’s self-report of infection. Following this education patient reported infection could potentially be more accurate and could follow the currently used definition of surgical site infection.

Whilst the responses from completed questionnaires identified how this patient group were managed in terms of their pathway of care, descriptive data from the questionnaire did not reveal anything about the patient’s experience of their treatment and care relating to their post operative recovery. Phase Two of the study has gone some way into exploring these experiences.

The findings of the study presented here have highlighted areas within the patient pathway where improvements can be made. What has been shown is that this patient group is vulnerable, and worried about what is happening to them. Improved communication between healthcare professionals and patients needs to aim to prevent the alienation of this patient group, who require additional support and attention.

Several recommendations for future practice are made on the basis of the study presented within this thesis. Further exploratory work in other healthcare organisations would be useful to identify if this ‘mismanagement’ of patients
occurs elsewhere. The development of National Standards, such as those presented relating to the treatment of patients with suspected myocardial infarction would provide consistent treatment across healthcare professionals and between healthcare organisations. Ensuring that wherever a patient presents with a suspected surgical site infection, whether it be at the General Practitioner’s surgery, the Accident & Emergency department or the hospital outpatient setting, the treatment offered should remain the same. These nationally recognised standards would need to present evidence based pathways that would support clinicians dealing with suspected surgical site infections. The use of such standards would reduce the variability that appears to be evident in current healthcare provision to this patient group. Diagnosing surgical site infection, in the initial presentation, relies on the judgement of the individual clinician/healthcare practitioner as swabs and other diagnostic tools take time to produce results (Krukerink, Kievit and Marang-van de Mheen, 2009). The presence of best practice guidance, in the form of national standards, would support appropriate treatment when infection is suspected, whilst clinicians wait for results. These standards would need to include best practice in relation to how specimens are taken and dealt with, the timing of specimen collection in relation to the administration of antibiotic therapy and the use of appropriate antibiotic therapy.

In this healthcare organisation at pre-operative assessment and on discharge from hospital patients are given information about who to contact in the hospital if they are experiencing problems with their wound healing. However this study showed that few patients utilised this service. Others have found patients require more information on discharge from hospital. In their study on post
discharge support following elective hip replacement, Mandy, Pearman and Ross (2000) identified 28% of those questioned reported the need for more information on services available post discharge from hospital. The need for more information, easily accessed and presented in a simple format was also identified as part of this study. Further work needs to be undertaken to explore the reasons why patients did not utilise this service and how this could be improved for the future.

As a result of this study changes have already been instigated. Collaborative work has already been undertaken with an implant manufacturer to develop and produce patient education and information guide relating to their surgery and their post operative recovery. This resource contains information relating to wound management, what the post operative wound may look like and exercises and advice regarding managing at home after surgery. This information is now given to patients when they are placed on the waiting list and the booklet is designed to accompany them on their journey. The information relating to their proposed surgery starts at the pre-admission process and continues through to include information relevant until six weeks post discharge. It provides contact details of specifically trained orthopaedic healthcare professionals who they should contact if problems develop post discharge. Further work is also being planned to revisit management pathways within the local healthcare organisation with a view to re-launching the local management pathways with colleagues in both primary and secondary care. The importance lies in developing a quality clinical management pathway that healthcare practitioners will routinely use to guide practice. These clinical pathways need to be more robust, in terms of utilising best evidence based practice, more ‘user’
friendly, and to promote compliance across both primary and secondary healthcare provision. It is hoped that by re-launching the pathway and involving the different healthcare practitioners for this patient group follow-up care be managed more appropriately across the primary/secondary care boundary.
CHAPTER SIX: PERSONAL REFLECTIONS

6.1 Introduction

In this chapter I will reflect on my professional doctorate journey starting with the personal reasons for undertaking a professional doctorate, my thoughts on the research process and concluding with an overview of how the doctoral programme has, I feel, supported my professional development.

Professional doctorates were introduced into the United Kingdom in the 1990’s (Scott, Brown, Lunt & Thorne, 2004). The key impetus behind the development of professional doctorate training stemmed from criticism that traditional PhD training focused on preparation for a career in academia (Scott et al, 2004). In comparison professional doctorates seek to combine the needs of professional practice and research relevant to a practice setting, (Lee, 2008). The professional doctorate has evolved as a highly structured research award where the focus is “to meet the needs of professional groups wishing to develop research knowledge and skills for professional practice” (Lee, 2008, p.21).

Combining practice and research provides challenges. In this instance the challenge was the transition from a senior, experienced professional to a novice researcher. This required considerable re-adjustment, to find a balance between both professional and personal priorities (Lee, 2008). Although an increasing number of PhD training may contain taught elements, similar to professional doctorate training, these tend to be individualized based study programmes rather than cohort based as is found with professional doctorates (Lee, 2008, p.11). At the University of Portsmouth, the professional doctorate programme consisted of two main elements, the taught component and the research component. All the elements of my doctoral programme were aimed to
develop mixed research skills. These included qualitative and quantitative methodology, critical appraisal skills, academic writing skills as well as developing presentation style.

Prior to commencing the doctoral programme I evaluated my personal learning objectives for the programme, to ensure I made the most of the resources available to me. This involved using SWOB (strength, weaknesses, opportunities and barrier) assessment, identification of previous transferable skills and the knowledge obtained highlighted the potential gaps. (Appendix 13 contains a summary of the learning objectives identified.) One of my learning objectives for the professional doctorate training was to develop confidence in my academic writing skills in order to achieve successful publications. A personal success from the early part of the doctoral programme came from the publication and dissemination module. Critical reading and writing skills were developed through evaluating papers presented by fellow students seeking publication. Following the support and advice from fellow students, I felt able to submit a paper based on previous research carried out as part of a masters programme. In 2008, I succeeded in having my paper on ‘A Multidisciplinary assessment and intervention for patients awaiting total hip replacement to improve their quality of life’ accepted for publication in the peer reviewed journal, Journal of Orthopaedic Nursing (Sandell, 2008).

6.2 Personal reasons for undertaking a professional doctorate

My current role as an advanced practitioner already transcends the traditionally delineated roles of both nursing and medicine. As a nurse I work within the
terms of the United Kingdom Central Council for Nursing and Midwifery, however some examples of the extended roles I undertake include:

- The ordering and interpretation of diagnostic tests (serological and radiological),

- Making clinical diagnosis and treatment plans based on tests results

- Prescribing of medicines.

However, having worked as an advanced practitioner in this capacity for over ten years, I had felt I had reached a “ceiling” with respect to new ways of advancing my career. The introduction of the nurse consultant role (Department of Health, 1997) fully embraced the concept of further education, because consultant nurse roles incorporate a 50% clinical element, with the remainder being attributed to undertaking research, education and developing professional practice. As a specialist nurse there was an expectation that I would be educated to Masters level. To progress to nurse consultant, a doctorate level qualification was likely to be considered important. After considerable information gathering, discussion and deliberation I decided to opt for a professional doctorate. I felt that I would benefit from a taught element that would focus around the needs of my proposed research. The professional doctorate offers such a programme, where study and research occurs in synchronicity with the practitioner and their workplace Scott et al (2004).

However, there were some specific drawbacks to undertaking this type of professional doctoral programme. Embarking on a part time doctoral level course, has involved, to date, over six years to get to this point. There have been a number of changes in my working environment during this time.
including; changes in Government and political agendas, changing financial constraints, local management restructuring and changes affected by new evidence and improved technology. This has made managing a research programme and participation in an academic programme challenging. Obtaining and maintaining full support from my own department whilst retaining protected time and funding proved difficult at times to sustain.

6.3 Personal incentives behind research undertaken

Firstly, within my clinical role I noticed clusters of infection within my hospital but these were not apparent in the reported national data. I began to wonder why locally I was seeing patients being readmitted with infections, that had developed post discharge, and yet the national and local data would appear to miss these infections in the surveillance figures reported. This led me to investigate why the current surveillance methods did not reflect what was being seen in practice. I questioned what was it about current surveillance methods that were not reporting what was being seen in practice?

The development of my second research question arose specifically from involvement in the clinical care of a specific patient. Over several years, I had found that patients with an infected joint replacement provide a considerable challenge to clinical management. I recalled one particularly difficult clinical case which, following several failed surgical attempts to eradicate a joint infection, prolonged treatment with antibiotics and revision surgery, ended up with amputation of the infected limb. Reflecting upon this case made me realise that, although I had many years of nursing experience, I could only guess at what the patient had experienced - I didn’t know how they felt, how they
perceived their treatment and clinical care, or how the infection impacted on their very being. The multidisciplinary team have fleeting interaction with the patient on the ward round or at 20 minute outpatient appointments, although the patient was experiencing this life changing situation 24 hours a day. My role was to plan service redesign that included how best to manage and limit the impact of joint infections in this patient group. I was expected to do this without fully understanding the true patient experience from operation through their post-operative period, their developing an infection and beyond and possible onwards on a journey that could lead to leg amputation. Armed with these two driving forces (the conundrum of why current surveillance was not working and the patient experience) I set about to develop my research question.

### 6.4 Reflections on the research process

I feel that I have developed both educationally and emotionally since undertaking this doctoral training. The task of writing a research proposal for university review and an application for NHS ethical review were both challenging. As I wrote and re-wrote draft versions of documentation for peer review and assessment by my academic supervisors, despite receiving constructive criticism, at times I felt overwhelmed. With hindsight, I appreciate that this process provided an excellent learning opportunity for development of many skills including clear presentation of focussed research questions and the ability to inform others why this research required answering. The challenge of writing a research proposal which was informative and considered important enough to obtain NHS ethical approval was particularly daunting. Although I felt anxious whilst waiting to attend the ethics committee meeting I did not find this aspect of the journey as traumatic as anticipated. At this point in my doctoral
studies as I reflect upon the journey so far, I can see that this ‘painful’ and time consuming process has provided an excellent learning opportunity to develop and argue succinctly the rationale for the research study as well as the methodology and the need for support.

The stories shared by the patients interviewed were revealing and I felt honoured that they trusted me enough to allow me to listen to their own experience of their personal journey. I was surprised at how humbled I felt to be sharing their experience. They were sharing their experiences because they wanted to help and prevent others to undergoing similar experiences. Colleagues had told me that there are certain points in a research project where you feel a strong affinity for what you are doing and why. I was lucky to share these patients’ journeys; it reinforced my belief that I had chosen the right question.

Despite qualitative methodology training, conducting the research has been a steep learning curve. In particular, I have learned a lot about the complexities of conducting and doing a qualitative research study informed by a descriptive phenomenological approach. This personal journey has not been easy and I have sometimes struggled to transfer my understanding of the basic concepts of phenomenology to other professionals and I realise that in the beginning I appeared to be speaking in another language! I have overcome this hurdle and feel empowered by the advice of experts in the field who shared, with me, their vision of this complex subject (especially Richard Adams of the Cochrane Centre, Oxford). At my lowest point of this journey he offered me support and advice. To some extent I realise that with research, the struggle is part of the
journey and it makes the ‘end’ of the journey all the more precious. I was naïve at the outset feeling that the journey would be linear; straightforward, and would progress smoothly. I did not appreciate how twisted and circuitous the process would actually be, or how much I needed on-going advice and support from so many in different walks of life, professional and non-professional, both direct and indirect.

I have found the process of undertaking a phenomenological study enlightening, a view supported by Harvey (1993). I hope that I will continue to be receptive to the perceptions of others and explore the meaning of words used by patients without judgement. I now recognise within my own practice that I (and probably many others within the NHS) make assumptions about a patient’s experience (also discussed in Chapter 5). The scale of bracketed pre-conceptions around the experience of patients with joint replacement infections and how this differed from the experiences revealed in the interviews surprised me.

6.5 Dissemination

Dissemination of research findings are according to Crosswaite and Curtice (1994) an important element of the research process. I concur with this view and also realise that unless research information is widely disseminated it may have little value in changing current practice. In 2011, I presented the findings from Phase One to the Arthroplasty Care Practitioner Association at their annual conference, where it was well received and generated debate and discussions regarding the issues practitioners face about collecting and analysing accurate surveillance data on surgical site infection in patients with
joint replacement. Further plans for dissemination of the research findings, both locally and nationally, are presented in Table 6.1.

### Table 6.1: Future plans for dissemination of research findings

<table>
<thead>
<tr>
<th>Time frame</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 2012</td>
<td>Presentation to department colleagues, and healthcare organisation</td>
</tr>
<tr>
<td>May 2012</td>
<td>Engagement and sharing of results with primary care colleagues</td>
</tr>
<tr>
<td>June 2012</td>
<td>Preparation of papers for publication covering Phase One and Phase Two</td>
</tr>
<tr>
<td>October 2012</td>
<td>Presentation to the Association of Maltese Orthopaedic Nurses (abstract being prepared for submission)</td>
</tr>
<tr>
<td>August/September 2012</td>
<td>Engaging with key members of the Arthroplasty Care Practitioner Association to debate and discuss developing national standards in relation to the management of joint replacement infections in preparation to the annual conference in 2013</td>
</tr>
</tbody>
</table>

### 6.6 Personal journey

It would be true to say that this journey has been significantly more challenging than I originally believed. I had worked hard throughout the taught part of the course and appeared to meet all of the expected standards. In the early years, the production of the professional development portfolio encouraged both reflection on previous learning, professional development and clinical skills as well identifying new learning and skills required to be able to plan and set deadlines from the beginning of this journey. As I look back at this professional development portfolio I can see learning and personal growth has taken place both in terms of research knowledge and skills, as well as professional development, a journey from pre-registration to advanced practitioner. Using reflective practice techniques (incorporating models of reflection) I explored my professional development from pre-registration to present day practice. Exploring personal learning styles within the context of practice development, helped identify strengths and weaknesses in my current knowledge base, which I could then address within the taught element of the doctoral programme.
I knew that the research project would be challenging, however, I have discovered that I have considerable determination, something not previously recognised. I was also mindful that I had a duty to the patients taking part in the research study; that their involvement would not be wasted. From this new found determination has come a different form of assertiveness which has encouraged me to develop a rich network of both emotional and intellectual support. I have tried to make the most appropriate use of the wisdom and support of key players throughout this journey.

I am also amazed at the generosity of time and kindness shown by my peer support network, both within the cohort of the doctoral programme and from other professionals from my own department. This generosity, I believe is partly due to their interest in the research study itself, but also that they were keen to support its success and ensure the best outcomes are delivered from this research. This, however, is not easy at a time when those working in the NHS are experiencing increasing workloads, with a reduction of staff numbers due to financial pressures. Each of the individuals who have supported me, despite the pressures in their own working life, still found additional time to give, support and advice and share their wisdom. The extent and generosity of their support made me feel valued - and that was a very positive emotion when at times the journey was hard, for this reason I believe their support to be priceless.

Whilst undertaking this research as part of the professional doctorate of nursing I feel that my own profile at departmental level and within the wider healthcare organisation has increased. Haigh (2008) describes this in terms of developing
a ‘presence’. The recognition that the work I was doing was important to my colleagues re-enforced and partially justified the value I had personally placed on the research I was undertaking. It also strengthened the role I have within the team in terms of being able to influence the way we as a department develop the services we provide. The in-depth knowledge that I gleaned from the research process and the interactions with patients allowed me to inform important members of the team how our interactions with patients are perceived by them and what we may be able to do to improve and enhance the patients’ personal journey. I consider this (i.e. the appreciation and value with respect to this project) especially relevant considering the majority of these colleagues are from a medical background where the value of qualitative research methodologies is not always recognised. The research also raised my profile within the organisation because it has brought me into closer contact with other departments (infection control, pharmacy for example), where the interaction (because of the research) has fostered closer working relationships that will continue to grow long after this piece of research has been concluded.

6.7 Conclusion

As I reflect on the process of undertaking a professional doctorate, although it has been a hard journey, with a steep learning curve, it is nevertheless one that I have enjoyed. I am a changed person. Whilst remaining a clinician at heart, I look forward to developing and growing in confidence as a practitioner researcher supporting the transformation of experiential knowledge into espoused theory for use in current practice.
REFERENCES


factors, microbiology, and outcomes. American Journal of Infection Control. 37 (8), 653-657.


Thomas, S.P. (2005) Through the lens of Merleau-Ponty: advancing the phenomenological approach to nursing research. Nursing Philosophy, 6, 63-76.


Dear Mrs Sandell

Study Title: An exploration of the 'burden' of infection following total hip and total knee replacement on both patients and the healthcare organisation.

REC reference number: 09/H0501/47
Protocol number: 1

The Research Ethics Committee reviewed the above application at the meeting held on 19 June 2009. Thank you for attending to discuss the study.

Documents reviewed

The documents reviewed at the meeting were:

<table>
<thead>
<tr>
<th>Document</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter to accompany questionnaire</td>
<td>5</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Participant Consent Form</td>
<td>3</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Participant Information Sheet</td>
<td>5</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Letter of invitation to participant</td>
<td>1</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Questionnaire Non Validated</td>
<td>2</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Covering Letter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protocol</td>
<td>1</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Investigator CV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Application</td>
<td>5.6</td>
<td>18 May 2009</td>
</tr>
<tr>
<td>CV for Supervisor</td>
<td></td>
<td>21 May 2009</td>
</tr>
</tbody>
</table>

Provisional opinion

The Committee would be content to give a favourable ethical opinion of the research, subject to receiving a complete response to the request for further information set out below.

The Committee delegated authority to confirm its final opinion on the application to the Chair.

This Research Ethics Committee is an advisory committee to South Central Strategic Health Authority.

The National Research Ethics Service (NRES) represents the NRES Directorate within the National Patient Safety Agency and Research Ethics Committees in England.
Further information or clarification required

Patient Information Sheet

a) Please add the following phrase to the patient information sheet “if you decided not to take part this will not affect your care in any way”
b) Please highlight on both invitation letters that the process is not part of patient care but is part of a research study;
c) Please increase the font size of the PIS to accommodate older participants’ eyesight;
d) Please use the word ‘may’ have had an infection’ under the title ‘Why have I been chosen on the PIS.
e) Please change the title to section 7 on the PIS to ‘What would I have to do’..
f) Please amend the word ‘personal’ to ‘personnel’ in section 11 of the PIS;
g) Please note in the PIS that there is no benefit to the participants taking part;

Questionnaire

a) Please amend the questionnaire to show that if the answer to question 2 of the questionnaire is no there is no need to continue, and thank the participants for their help;
b) Please make it explicit that the questionnaire is not required to be filled in and posted after six-weeks but six-weeks after the operation as the Committee deemed this statement to be confusing;
c) The Committee suggest that you pilot the questionnaire on a small number of patients before using;
d) Please redesign the paperwork to show the specific reason for the participants’ visit to their GP.

Invitation Letter

a) Please take out the word 'important' from paragraph 3 of the invitation letter i.e. “You are not obliged to complete this questionnaire but it is ‘important’, as this is deemed to be coercive by the Committee;

Interview Structure

a) Please provide the Committee with a structure of the interview;

Other

a) Please use a less emotive title for the patient documentation;
b) Please confirm that all the Consultant Surgeons are in agreement with the study taking place in their department;

When submitting your response to the Committee, please send revised documentation where appropriate underlining or otherwise highlighting the changes you have made and giving revised version numbers and dates.

The Committee will confirm the final ethical opinion within a maximum of 60 days from the date of the initial receipt of the application, excluding the time take by you to respond fully to the above points. A response should be submitted by no later than 27 October 2009.

This Research Ethics Committee is an advisory committee to South Central Strategic Health Authority

The National Research Ethics Service (NRES) represents the NRES Directorate within the National Patient Safety Agency and Research Ethics Committees in England.
Membership of the Committee

The members of the Committee who were present at the meeting are listed on the attached sheet.

Dr P Moonot informed the Committee that he worked in the same department as the researcher but had no input to the study. The Committee decided that there was no conflict of interest.

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

09/H0501/47 Please quote this number on all correspondence

Yours sincerely

[Signature]

Mr Simon Dabbs
Chair

Email: scsha.SEHREC@nhs.net

Enclosures: List of names and professions of members who were present at the meeting.

Copy to: Dr Mark Pugh, Chair of the Research & Development Committee, St Mary's Hospital IOW.

This Research Ethics Committee is an advisory committee to South Central Strategic Health Authority

The National Research Ethics Service (NRES) represents the NRES Directorate within the National Patient Safety Agency and Research Ethics Committees in England
Isle of Wight, Portsmouth & South East Hampshire Local Research Ethics Committee

Attendance at Committee meeting on 19 June 2009

Committee Members:

<table>
<thead>
<tr>
<th>Name</th>
<th>Profession</th>
<th>Present</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mr Paul Andersen</td>
<td>Broadcaster</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Mr David Carpenter</td>
<td>Clinical Scientist</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Dr Paul Cockcroft</td>
<td>Consultant Microbiologist</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Mr Simon Dabbas</td>
<td>Pharmacist</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Dr Pradeep Moonot</td>
<td>SpR Trauma &amp; Orthopaedics</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Dr Lynne Oldman</td>
<td>SpR Child &amp; Adolescent Psychiatry</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Dr Anumugam Ravindran</td>
<td>Consultant Physician</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Dr Richard Thwaites</td>
<td>Consultant Paediatrician</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Mrs Jayne Tyler</td>
<td>Senior Fire Control Operator</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Dr Marcus White</td>
<td>Lecturer</td>
<td>Yes</td>
<td></td>
</tr>
</tbody>
</table>

Name

Mrs Melodie Kreindler Committee Co-ordinator

This Research Ethics Committee is an advisory committee to South Central Strategic Health Authority.

The National Research Ethics Service (NRES) represents the NRES Directorate within the National Patient Safety Agency and Research Ethics Committees in England.
Appendix 2
Dear Mrs Sandell

Study Title: An exploration of the 'burden' of infection following total hip and total knee replacement on both patients and the healthcare organisation.

REC reference number: 09/H0501/47
Protocol number: 1

Thank you for your letter of 16 July 2009, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

For NHS research sites only, management permission for research ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nha.uk. Where the only involvement of the NHS organisation is as a Participant Identification Centre, management permission for research is not required but the R&D office should be notified of the study. Guidance should be sought from the R&D office where necessary.

This Research Ethics Committee is an advisory committee to South Central Strategic Health Authority. The National Research Ethics Service (NRES) represents the NRES Directorate within the National Patient Safety Agency and Research Ethics Committees in England.
Sponsors are not required to notify the Committee of approvals from host organisations.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

<table>
<thead>
<tr>
<th>Document</th>
<th>Version</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Letter to accompany questionnaire</td>
<td>5</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Letter to accompany questionnaire</td>
<td>5</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Participant Consent Form</td>
<td>3</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Participant Information Sheet</td>
<td>5</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Questionnaire: Non Validated</td>
<td>2</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Covering Letter</td>
<td></td>
<td>14 May 2009</td>
</tr>
<tr>
<td>Protocol</td>
<td>1</td>
<td>13 May 2009</td>
</tr>
<tr>
<td>Investigator CV</td>
<td></td>
<td>14 May 2009</td>
</tr>
<tr>
<td>Application</td>
<td>5.6</td>
<td>18 May 2009</td>
</tr>
<tr>
<td>CV for Supervisor</td>
<td></td>
<td>21 May 2009</td>
</tr>
<tr>
<td>Interview Schedule</td>
<td>1</td>
<td>10 July 2009</td>
</tr>
<tr>
<td>Letter with Questionnaire</td>
<td>2</td>
<td>01 July 2009</td>
</tr>
<tr>
<td>Response to Request for Further Information</td>
<td></td>
<td>16 July 2009</td>
</tr>
<tr>
<td>Participant Information Sheet</td>
<td>5</td>
<td>01 July 2009</td>
</tr>
<tr>
<td>Letter of Invitation to participant</td>
<td>6</td>
<td>01 July 2009</td>
</tr>
<tr>
<td>Questionnaire</td>
<td>3</td>
<td>01 July 2009</td>
</tr>
</tbody>
</table>

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Now that you have completed the application process please visit the National Research Ethics Service website > After Review

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

The attached document “After ethical review – guidance for researchers” gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Progress and safety reports
- Notifying the end of the study

This Research Ethics Committee is an advisory committee to South Central Strategic Health Authority

The National Research Ethics Service (NRES) represents the NRES Directorate within the National Patient Safety Agency and Research Ethics Committees in England
The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

We would also like to inform you that we consult regularly with stakeholders to improve our service. If you would like to join our Reference Group please email referencegroup@nres.npsa.nhs.uk.

Yours sincerely

Mr David Carpenter
Chair

Email: scsha.SEHREC@nhs.net

Enclosures: “After ethical review – guidance for researchers” SL-AR1 for CTIMPs

Copy to: Dr Mark Pugh, Chair of the Research & Development Committee, St Mary’s Hospital, Parkhurst Road, Newport, IOW

This Research Ethics Committee is an advisory committee to South Central Strategic Health Authority

The National Research Ethics Service (NRES) represents the NRES Directorate within the National Patient Safety Agency and Research Ethics Committees in England.
Appendix 3
2 September 2009

Clare-Louise Sandell
Orthopaedic Nurse Specialist
Isle of Wight NHS Primary Care Trust
St Mary’s Hospital

Dear Clare-Louise

Student Research – An exploration of the “burden” of infection following THR and TKR on patients and the healthcare organisation

Further to my letter of 9 August, I am writing to confirm receipt of written confirmation of a favourable ethical opinion from IOW, Portsmouth & S E Hants LREC.

With regard to the issue of Sponsorship, it transpires that your original application form to NRES confirmed the University of Portsmouth as your Sponsor, with Ann Dewey as your academic supervisor and signatory to the Sponsor Declaration. However, I understand that this was returned by our local REC as Ann is not a recognised signatory for University sponsorship. Denise Teasdale was confirmed by them as the University signatory and Dr Mark Pugh for our organisation.

As this amendment to your application form had to be turned around within 4 days, you opted to put Dr Mark Pugh down as a signatory on the Sponsor Declaration page, who subsequently signed the form, but the Sponsor details within the body of the form remained as University of Portsmouth, which was not picked up by our local REC.

Given the low risk nature of this study and the tight timescales that you are working to, I confirm that the Isle of Wight NHS Primary Care Trust agrees to accept the role of sponsor for the above study on this occasion, as set out in the Research Governance Framework for Health and Social Care (second edition, April 2006). Data collection from this site may now commence.

I wish you every success with your study.

Yours sincerely

Alexandra Punter
Research Management and Governance Lead

cc: Melodie Kriendler, REC Co-Ordinator, IOW, Portsmouth & S E Hants REC
Appendix 4
Dear «Title» «Surname»

Please can you complete the following questionnaire and return it in the pre-paid envelope. The personal details have been completed for you, please amend any incorrect details.

**Personal Details**
«Title» «Forename» «Surname»
«Address1»
«Address2»
«Address3»
«Address4»
«PostCode»
«ProcDate»

*Please complete the following questionnaire 6 weeks after your operation and return it in the envelope provided.*

This questionnaire is looking at wound healing and the occurrence of infections following total hip and total knee replacement surgery.

1. Do you remember how long you were in hospital following your operation?

....................days.

2. In your opinion did you develop a surgical wound infection? (Not including the swelling and tenderness normally associated with a new surgical wound)

□ YES □ NO

*If your response to Question 2 is NO there is no need to continue with the questionnaire. Please return the form in the pre-paid envelope. Thank you for your participation.*
3. Do you remember at what stage following surgery the problem with your wound developed?

Before Discharge  
After Discharge

Days/ Weeks/ (Please circle as appropriate)

4. Please identify, using the criteria below, how your wound problems presented.

Was there any discharge or leakage of fluid from any part of the wound at any time?

☐ Yes  ☐ No

If yes was it either;

☐ Clear  ☐ Yellow/green (pus)
☐ Blood stained  ☐ other-please specify

Please tick all of the following that applied to your wound or the area surrounding your wound

☐ Pain or soreness in addition to the discomfort experienced following the operation.
☐ Redness and swelling around the wound
☐ Swelling but no redness around the wound
☐ The area around the wound felt warmer/hotter than the surrounding skin.
☐ The edges of any part of the wound separated or gaped open

5. As far as you were aware, did any healthcare worker take a sample from your wound to send to the laboratory?

☐ Yes  ☐ No  ☐ Not sure

Date

6. If you saw a healthcare professional because of a suspected wound infection please indicate who you saw and for what period of time, from the list below. You may tick more than one-

<table>
<thead>
<tr>
<th>Healthcare Professional</th>
<th>Once a week</th>
<th>Twice a week</th>
<th>Daily</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>District Nurse</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doctor or nurse at the hospital</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other- Please specify</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Did not see anyone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. Have you been prescribed antibiotics for an infection in the wound?

☐ Yes  ☐ No
If yes, who prescribed them? ________________________________

Do you know which ones they were? __________________________

If you do not know which antibiotics were used, are you agreeable for me to contact your GP to find out?

☐ Yes  ☐ No

8. Have you been re-admitted to hospital with an infection of the surgical wound?

To St Mary’s Hospital  ☐ Yes  ☐ No

To another hospital  ☐ Yes  ☐ No, if yes which one _______________

Please add any additional comments you may feel will be of interest to us relating to your wound infection………………………………………

………………………………………………………………
………………………………………………………………
………………………………………………………………
………………………………………………………………
………………………………………………………………
………………………………………………………………

If you developed a wound infection would you be willing to be contacted by letter, inviting you to participate in discussing your experiences in further detail by taking part in a personal interview? This could take place in your home or in the hospital at your convenience.

☐ No  ☐ Yes  If yes, Preferred contact number

……………………………..

Ticking the box does not commit you to taking part in the research project, if you agree to be part of of the research you will be contacted with more information regarding the process involved. If you have any questions you may contact me at any time.

Thank you for your participation.

Researcher name and contact details presented here
Appendix 5
Dear «Title» «Surname»

**Study Title: An exploration of the experience of infection following total hip and total knee replacement surgery on patients and the healthcare organisation.**

My name is Clare-Louise Sandell and I am a Specialist Nurse in Orthopaedics currently working here at St Mary’s Hospital, Isle of Wight. I am also enrolled as a doctoral student with the University of Portsmouth for which I am undertaking this research study. This invitation relates to the research being undertaken and does not form part of your usual patient care post surgery.

The purpose of this study is to identify and understand what it is like for those patients who experience a surgical site infection post total knee replacement and total hip replacement surgery. Through understanding the experiences of those who have had wound infections healthcare professionals will be able to tailor their care packages to meet the particular needs of this patient group.

With this letter is a questionnaire. You have been chosen to receive this questionnaire as you have recently undergone a total knee or total hip replacement. You are not obliged to complete this questionnaire but we would find it very useful to get as many responses as possible so that we can get a true representation from all those who have undergone total knee and total hip replacement surgery.

The attached questionnaire concerns your recovery after surgery and whether you developed any problems with the wound healing. It should not take long to fill in (approximately 20 minutes) and I have enclosed a stamped addressed envelope for your convenience. In the meantime, if you have any questions on the study that you would like to discuss with me please telephone me on 01983 534064 or alternatively email me at email address inserted. Thank you for taking the time to participate in this study.

Yours sincerely,

Clare-Louise Sandell
Orthopaedic Nurse Specialist
Appendix 6
Algorithm for pathway of orthopaedic patients with surgical wound problems following total hip or total knee replacement surgery

1. **Patient has had total knee replacement or total hip replacement**
   - **Yes**
     - **Problems with wound before discharge home**
       - **Yes**
         - **Is patient suitable for discharge home?**
           - **Yes**
             - Ward to arrange for patient to be seen in wound review clinic.
           - **No**
             - **Continue review as inpatient under consultant care**
               - **Discharge patient with wound review clinic details in PILs**
               - **Patient/Carer/Healthcare practitioner concerned about surgical wound**
                 - **Yes**
                   - **Is patient suitable to be seen following day?**
                     - **Yes**
                       - **Healthcare professional to leave message for Nurse Specialist with patient name and phone number**
                         - **Orthopaedic nurse specialist to make clinic arrangements and liaise with PAAU for use of room**
                     - **No**
                       - **Contact SHO on call to arrange to see patient at hospital via hospital switchboard …………**
                 - **No**
                   - **Key: PIL- Patient information Leaflet; SHO- Senior House Officer; PAAU- Pre Operative Assessment Unit**
Appendix 7
Dear «Title» «Surname»,

**Study Title: An exploration of the experience of infection following total hip and total knee replacement surgery on patients and the healthcare organisation.**

My name is Clare-Louise Sandell and I am a Specialist Nurse in Orthopaedics currently working here at ........ I am also enrolled as a doctoral student with the University of Portsmouth for which I am undertaking this research study. This invitation relates to the research being undertaken and does not form part of the usual patient care post surgery.

The purpose of this study is to identify and understand what it is like for those patients who experience a surgical site infection post total knee replacement and total hip replacement surgery. Through understanding the experiences of those who have had wound infections healthcare professionals will be able to tailor their care packages to meet the particular needs of this patient group.

You have been chosen because on a previous questionnaire you identified that you had developed a surgical site infection and agreed to be contacted with regard to taking part in a personal interview. The attached Information sheet indicates what might be involved if you decide to take part. You are in no way obliged to take part.

If you would be willing to take part or have any questions on the study that you would like to discuss with me please telephone me on ........ or email me at ............... , alternatively I can be contacted on the address at the top of this letter.

Thank you for taking the time to read the information enclosed..
Yours sincerely,

Clare-Louise Sandell
Orthopaedic Nurse Specialist
Appendix 8
Patient Interview Information Sheet

1. **Study title**

An exploration of your experience of infection following total hip (THR) and total knee replacement (TKR) surgery on patients and the healthcare organisation

2. **Invitation paragraph**

You are invited to take part in the above research study. To help you make your decision of whether or not to take part, it is important for you to understand why the research is being undertaken and what it will involve. Please take time to read the following information carefully. Talk to others about the study if you wish. Ask us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part. If you decided not to take part this will not affect your care in any way.

3. **What is the purpose of the study?**

The purpose of this study is to identify and understand what it is like for those patients who experience a surgical site infection post TKR and THR surgery. Through understanding, the experiences of those who have had wound infections, healthcare professionals will be able to tailor their care packages to meet the particular needs of this patient group.

This project is being undertaken as part of a Professional Doctorate program in nursing, based with the University of Portsmouth

4. **Why have I been chosen?**

You have been chosen because on a previous questionnaire you identified that you may have had a surgical site infection and agreed
to be contacted to be interviewed. This Information sheet indicates what might be involved if you decide to take part. You are in no way obliged to take part.

5. **Do I have to take part?**

No. It is up to you to decide whether or not to take part. If you do, you will be given this information sheet to keep and be asked to sign a consent form. You are free to withdraw at any time, without giving a reason.

6. **What will happen to me if I take part?**

An appointment will be made to meet with you, either at the hospital or in your home; whichever is more convenient for you. This will be at a time you agree and the interview will last approximately one to one and a half hours. The interview will be tape-recorded, the tapes will then be transcribed and the information analyzed. You may then be asked to read the analysis and say whether you agree that this is a true reflection of your experience. If you are asked to read the analysis and confirm that this is a true reflection this may take a further one to one and a half hours.

7. **What would I have to do?**

The only requirement is you need to talk about and describe your experience. There are no right or wrong answers. You will be asked to describe the experiences of your journey before, during and after surgery. We want to gain an understanding of your experiences having developed a wound infection.

8. **What are the other possible disadvantages and risks of taking part?**

It is not anticipated that there will be any risks to you.

9. **What are the possible benefits of taking part?**

The benefits of taking part will be that some time people, gain comfort from sharing with another their experiences. There will be
no direct benefit to you as a participant taking part in this study The benefit might be that we can collate and share your experience with others to better inform healthcare professionals of what patients go through and it is hoped this will help shape future healthcare provision.

10. **What if there is a problem?**

Any possible problem or complaint about the way you have been dealt with during the study or any possible harm you might suffer will be addressed. In the first instance by Clare-Louise Sandell who can be contacted on .......... or e mail address........... Or if you wish to comment on the treatment you received in the hospital please contact the Patients Advice and Liaison Service (PALS) on ............ for further assistance

11. **Will my taking part in the study be kept confidential?**

Your Right to privacy and confidentiality will be respected at all times. All data and information will be stored according to the Data Protection Act. 1998. It will be only stored on a Password Protected Secure Network within the (hospital name inserted) site. All transcripts of interviews will be coded and restricted personnel (usually lead researcher, academic supervisors) will have access to the data. All data collected will be destroyed following completion and write up of the study. Taped interviews can be returned to you if that is what you so wish. You will be asked at the time of the interview.

12. **What will happen to the results of the research study?**

It is intended that the results of this study will be published in nursing journals so that the information gained can be available to nurses working within this field. It will be possible for you to request a copy of the summary report on completion of the study. All data will be anonymous and participants will not be identified within any written report or in any way what so ever.
13. **Who is organising and funding the research?**

This research is being Supervised by: Ann Dewey, School of Health Sciences and Social Work (SHSSW), Portsmouth University who can be contacted on 02392 84 4426 or via e mail ann.dewey@port.ac.uk

The Study has been reviewed by (hospital name inserted) Research and Development Unit, The NHS Ethics Committee, and the SHSSW Research Ethics and Peer Review Committee.

14. **Contact Details:**

For any further information please do not hesitate to contact me, Clare-Louise Sandell on …………… or via e mail …………………

Thank you for taking the time to read this information sheet.
An overview of my personal reflections and preconceptions relating to infection following joint replacement surgery

These are personal preconceptions based upon the previous eighteen years of caring for patients who have undergone orthopaedic surgery, including joint replacement surgery. My experiences are that joint replacement surgery, on the whole, is a successful procedure, that has the potential to improve quality of life and restore functional ability. However in the rare instances when problems develop post surgery and infection develops the results can have a significant impact on the individual.

I am a female registered general nurse with specialised orthopaedic training. I have worked within orthopaedics for eighteen years, the last ten of which have been within a specialist role. The focus of this role has been around the care of patients who are going/ have undergone total hip and knee replacement surgery. Over the last ten years I have been involved in the management of patients who have developed surgical site infections following joint replacement surgery. Some of these patients have required long-term care that has resulted in the need for multiple investigations, multiple surgeries with long stays in hospital required.

Whilst looking after this patient group, who developed infection post joint replacement poses challenges for the healthcare professionals it is the impact on the patients that is not fully understood. Challenging because of the complexities of treating the infection, the restriction to their mobility and the problems patients experience because of the infection in terms of care required. It was not until I was exploring the issue of how this event impacts on patients I
realised I had made some assumptions based on previous experiences of looking after this patient group. I had not actually explored what the patients themselves felt about the experience of developing an infection.

I believed that patients experienced pain, discomfort, reduced mobility, fears for the future regarding revision surgery and the impact this might have on their long term mobility. I witnessed breakdowns in the patient/ healthcare practitioner relationship, but had not explored why this relationship broke down. I had a preconception that the experience of developing a surgical site infection could be described in terms of the ‘burden’ an infection placed on the individual and the healthcare organisation.

This previous experience led me to develop beliefs about what these patients experience in terms of infection and their hospital journey.
Appendix 10
Title: An Exploration Of The experience on patients and the healthcare organisation of infection following total hip and total knee replacement surgery.

Time of Interview

Date
Identification Number
Place of interview
TKR / THR

Verbal Explanation of project and process  Yes/ No
Written information received  Yes/ No
Consent form signed  Yes/ No

This schedule is an overview of the topics likely to be covered. The issues raised/explored in more depth will be dependant on what the individual participants choose to share about their experiences.

Opening Question

Please describe in your own words your experience of going into hospital for your total knee/hip replacement surgery. And then following on from sharing this experience, having left hospital can you share your postoperative recovery at home. Is that OK? (checks for agreement).

(Prompts will be used to try to elicit sufficient detail to discover the essence of the participant's experience (trying to elicit personal description and meaning free from generalisation and theoretical abstraction. Context will be key here.

I wish to thank you for sharing your experience with me. The information you have provided will assist me to gain an insight into your experience and I appreciate you sharing this with me.
Appendix 11
### Significant statements with formulated meanings attached.

<table>
<thead>
<tr>
<th>Significant statement</th>
<th>Formulated meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Interview 1</strong></td>
<td></td>
</tr>
<tr>
<td>Although they were very good to me as</td>
<td>Positive care experience</td>
</tr>
<tr>
<td>I had the operation and that was alright and I felt ok in bed and so on. Then after about three or four days they transferred us out</td>
<td>Positive care experience</td>
</tr>
<tr>
<td>So they just kept me there as long as they had to and got rid of me</td>
<td>Burden to others</td>
</tr>
<tr>
<td>That was quite nice and I got up here and I was very comfortable and liked the staff and it was very good</td>
<td>Positive care experience</td>
</tr>
<tr>
<td>Well it was the attention and the staff itself were humane and they were very understanding and very attentive all the time you know</td>
<td>Concept of caring</td>
</tr>
<tr>
<td>They got the doctor down from the hospital quickly and he had a look and he said 'ah yes' he said you have picked up an infection</td>
<td>Labelled as infected</td>
</tr>
<tr>
<td>Then it was explained to me how I got the infection was the drain pipe that comes out of the wound to keep things running whilst they are operating I believe it is supposed to come out within three seconds or so from the operation coming out somebody must have left it there for three minutes and that's where lots of infection got in.</td>
<td>Legitimate worry/ significant event</td>
</tr>
<tr>
<td>So I was improving a great deal there and that two weeks after the operation three weeks after the operation and this was getting better all the time. Then it started to get worse again and there are days when I can hardly walk at all or move now</td>
<td>Loss of function inability to cope</td>
</tr>
<tr>
<td>I am a very trusting type of person and I thought well if it happens it happens and then get on with it you know I trust you to sort me out properly, I am beginning to feel a bit differently about it now yes because urgh I am not cured at all and I should be. I have got a new knee in there that looks very nice isn't it but er what about all the rest you know it's really painful.</td>
<td>Trust turns to loss of trust as events take negative turn</td>
</tr>
<tr>
<td>I would have liked somebody like a physio people to come and see how I am getting on and for me to be able to say I don't think I am getting on very well can you explain why I am not getting on very well and am I doing things correctly or is there something else I should be doing or what you know</td>
<td>Uncertainty of outcome</td>
</tr>
<tr>
<td>I think one thing that upset me a little bit was I was going in tandem with a friend of mine we play golf together and he's a later day knee man you see and I have been like this for a long time and urgh and he gets in with (Surgeon name) and in he goes to hospital and he came out of the operation and he discharged himself from the hospital, he walks out and says ‘I'm off now’ and I thought yeah I am going to do that</td>
<td>Comparison to others/ benchmarking</td>
</tr>
<tr>
<td>I just wish that somebody would tell me what is going wrong with the rest of it and how I can put it right am I doing the right things, er which I can’t do much else</td>
<td>lack of information</td>
</tr>
<tr>
<td>I can only do what you give me the list to do er yes so er so yes I began to notice the patients in (care home name) are getting better and better and better and I am getting worse and worse and worse</td>
<td>Comparison to others/ benchmarking</td>
</tr>
<tr>
<td>And I don’t think anybody else said we’ve had an infection as well, I was the only one and er that was what caused me and set me back quite a lot</td>
<td>Comparison to others/ benchmarking</td>
</tr>
<tr>
<td>There are days when I am much worse than I have ever been and there are other days when I can go out without my stick or</td>
<td>Fluctuating ability leads to uncertainty/ vulnerability</td>
</tr>
</tbody>
</table>
anything and walk properly you know

So I am er a bit out on a limb. I don’t know really what’s happening, what is expected of me. I mean some people come out after three days and are alright playing golf and like you said this could be twelve months. Who else is experiencing twelve months? Or am I the very unlucky one

Uncertain of expectations caused by comparison to others

my feeling will be of this experience that I would like a bit more information and a bit more of a chat with someone who knows what is going on and what can I expect that’s all I am not sure you see where I am going next.

Lack of information

I am at the moment I might be a nuisance

Feels a burden to others due to reduced mobility

Interview 2

operation i had no problem at all. It all went very very well as expected

Positive care experience

There was definitely some sort of inflammation on the end of it there. I didn’t think too much of it because i thought well it would probably scar up because the rest of the scar was fine no problem at all. And er anyway eventually i thought well there is something wrong here so i did i went to the um the health centre and i saw the nurse there and she took me in and er said yeah you’ve got err an infection in there and a little pus in there.

Labelled by healthcare professional

The only thing I will say is that the previous hip I had, I found after a few days that I had this little um like a bit of catgut sticking out of one end.

Legitimate worry/ significant event

. But I would like to say that um I have no complaints about the treatment i had at all. In fact I have been extremely lucky in the national health service

Positive care experience

Interview 3

Also when I heard the sound of the saw and also the hammer, but um that didn’t worry me because it meant they were actually doing their job.

Reassurance by process

The cleanliness was really terrific and the cleanliness of the actual ward um I have no complaints what so ever just accolades.

Cleanliness/ providing a caring environment

I got what you would call it a post op infection but it wasn’t on the wound it was over the whole knee erm it was very very swollen, very very hot

Patient labels himself based on what he perceives I would call what was happening to him

Probably about probably three weeks almost three weeks, erm then it started getting worse I was getting stripes red stripes across from the knee up towards the groin. I was getting rather worried about it.

Symptoms patient associated with infection

I had to see my doctor on another matter anyway, so I went in to see her and she rung the hospital and she said she wanted to put me on some antibiotics, and they agreed to it. Whoever she spoke to, it was someone in the orthopaedic department um so I was put on a seven-day course at the end of the seven-day course

General Practitioner seeks expert opinion

Went to see my doctor again because I was getting rather concerned with it. She again rung the hospital somebody in the hospital said ‘oh no you shouldn’t have treated Mr …., you should have sent him straight up here’

Differing opinion given by different healthcare professional

And I saw a doctor in A&E he came down. I think he was a consultant actually I don’t know his name. Um he wasn’t all that bothered with

Felt to be not valued or considered important

I felt a little bit fluey, I forgot that sorry. Yeah I felt achy in my joints and a little bit fluey so I knew something wasn’t right

Symptoms patient associated with infection
### Interview 4

I was very impressed with everything. From the consultant down to the cleaners, they were all such kind people.

| Concept of caring |

What surprised me was being told that my wound was seeping and that was four days after the operation. And they wouldn't let me go home for another two more days. Which did upset me a bit, and I didn't know why I had got this infection.

| Outcome different to expectations so assumption made there was an infection |

Umm as far as I was concerned I never had any problems with it.

| Pt didn't feel unwell so how could she have an infection |

the nurse said to me ‘I think I better take a swab’ she said because I do this as a matter of course anyway um so I was not quite happy…..

| Poor explanation of what the healthcare professionals concern were led individual to speculate, causing worry |

And then I did get alarmed because when I went to the my GP surgery again with the clip removers. The nurse says ‘oh non’, she said ‘I am going to get the doctor to look at this’ so she went and got Dr (name). He comes along and pats me on the shoulder and said ‘straight back to the hospital’.

| No explanation of what the concerns were left a feeling of worry and uncertainty regarding progress |

And then after that I kept having to go back every week for blood tests. They were doing two blood tests and I was on antibiotics for about a month and I suppose I was taken aback. I don’t know what sort of infection it was. I can’t believe it was anything too serious because I would have felt poorly really poorly. Umm it was just tedious going backwards and forwards.

| Symptoms not matching preconceptions of what the experience of infection should present as. |

And some of the consultants that you see are quite sort of forthcoming.

| Provision of information appears to vary between healthcare professionals |

I mean I hadn’t really not coped oh I was depressed I was snapping at people I couldn’t sleep you know the sort of thing.

| Infection caused additional pressure individual was unable to cope with |

### Interview 5

I went to the hospital, my knee had blown up like a balloon I went to the hospital to the emergency um there was some very poor treatment there or there was hardly any treatment there.

| Presenting previous experience to set the scene |

I can only compliment everybody in the hospital in every manor the cleanliness of the hospital, the staff of the hospital, the attendants, everything was to perfection.

| Positive care experience |

In the last few days or so or maybe couple of weeks was I felt that maybe something had gone wrong with the knee because umm if I stand up now I can’t get the leg straight, I think maybe I haven’t exercised enough and maybe the leg is ceasing up but it tends to give way. I am not sure if, I am not sure whether it was noticeably straight before it seems to have developed a bit of a kick.

| Uncertainty regarding progress causes worry about function |

No I think that the you know the whole things come together very well. A compliment to you all.

| Positive care experience |

My compliments very much my compliments to you all, and to Dr (name) and to yourself these super duper.

| Grateful for success |

One of things that would have been nice especially in the last couple of weeks is if there was a telephone number that on could phone not necessarily for appointments, just to discuss you know, say I have go this pain is that normal? you know how long will I be with this/ and everything to just get a telephone conversation rather than bothering making appointments and things like that or coming into the hospital. That would be an sort of help line particularly just on that particular subject.

| Following on from experience, offering ways of improving the service |
| Interview 6 |
|-----------------|---------------------------------|
| I was a bit apprehensive about going in because for the previous two weeks before the surgery I had no pain, none what so ever. I was walking all right and I had thought about cancelling it because perhaps I thought it was not necessary. But anyway I did um go ahead with it and after the operation I asked Mr (Name) umm what the state of my knee was because I said as I had not had any pain I was worried I was like umm shouldn't have had the operation. He said at no time did he feel that I shouldn't have had the operation. It was well worn on the inside um you know it should have been done. So I was quite happy about that. | Reassurance from expert |
| I started to shake I was really cold, really cold. I heard him say 'his temperature is normal 37.1' and I heard so for god‘s sake will you keep him still because the table is very narrow. And I heard him say something like 'I will give him a drop of the old perthidine' and and then I was out of it. I came too in the recovery room covered in a heated umm blanket it was warming me up I was just so cold I said to them 'how many bits of stuff have I got hanging out of me now then' and umm the guy with me said ‘only your catheter’ so I said‘what happened to then drain then?’ and he said ‘it fell out when they transferred you from the operating table to the trolley’ | Significant event/ legitimate worry |
| He said it would be painful, err and as it went lower and lower the pain became more intense err I kept getting hold of the nurses because it was killing me, this pain was becoming unbearable | Loss of control of situation |
| She (physiotherapist) looked at the knee and she said‘I am not going any further get back into bed, I am not going to do anything more with that knee until the doctor has seen it’ so I said 'why what's up?' and err all the left side of my knee here is red. Very quite warm and red and umm she said I am going to call the doctor. So she called the doctor and she came back and said the doctor is aware of your situation and will be up to see you. And the nurses were looking at it and they were getting quite concerned because it was getting redder and bigger, and errm somebody came along with a marker pen and marked the extremities of the redness, to see if it was spreading. Sure enough it was going beyond the borders of the pen and err I know they phoned quite often and bleeped quite often. | Healthcare practitioners concern not reciprocated by the doctor |
| Yeah after that the next morning I looking at a complaint about this particular doctor, not the second one the one who had been there all day, because I felt she treated me with a bit of contempt. | Felt unvalued within the system |
| And never had a night’s sleep since I came out of the hospital. I can get no I can find no position comfortable where I could put my knee. I was up most of the night | Context in which this presented was that of despair |
| Went in to see my doctor, and asked if they could somehow adjust the medication so that most of it was at night because during the day as something’s were going on and moving it didn’t tend to hurt so much but at night it was absolute murder it | Trying to take control of the situation |
| He had a look at my knee you know and he said he wanted me to have a blood test. So he arranged for that, I had a blood test on the Thursday and err the Friday morning the doctor phoned me up and said ‘err you need to go to A&E and I’ve had a look at the results and it looks like you may have a minor infection in the knee and you know if we give you antibiotics then it will probably mask they have got better stuff than we've got any way up there | Considered this was being told he had an infection but responsibility was being passed on |
| And I said are you sure I am supposed to be having this because Mr (name)said I would be having this operation and | Healthcare professionals continually changing their
<table>
<thead>
<tr>
<th>Interview 7</th>
<th>Interview 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was looked after quite well.</td>
<td>As far as I was concerned the operation was quite successful.</td>
</tr>
<tr>
<td>Concerned, umm I didn’t understand what it was, what on earth had I done. It seemed to come out in such a gush.</td>
<td>Noticed my knee was becoming extremely hot and err having had an err err post operative infection before umm I knew this wasn’t right (laugh) so I immediately went over to err my doctors.......... he took one look at it, felt it and took my temperature and said yes you have something wrong</td>
</tr>
<tr>
<td>So I came in to see you and then you got a bit concerned and called Mr (name) in and he umm extracted more fluid a bit more fluid and said that he thought I had a n infection and he wanted to admit me then and there</td>
<td>At this stage I was getting a little frantic. Cause as you may or may not be aware. Two years previous to having this operation I had a triple A, abdominal Aortic aneurism repair which sadly</td>
</tr>
<tr>
<td>My main concern is now that I am not going to walk properly again. I don’t know how I am going to manage with a gammy left knee and this one unstable I just don’t know</td>
<td>I was a bit concerned and I said is anyone coming to see me, oh Mr (name) came yes that is right, to see me on the Friday, I think, and said I will come and see first thing in the morning, umm because at that stage they weren’t sure whether I needed to go back up into theatre. Umm to have it drained I suppose I don’t know. He didn’t come the following morning so when I enquired somebody was coming to see it they said Mr the duty surgeon whose name I didn’t know would come and see me later on, he didn’t turn up either.</td>
</tr>
<tr>
<td>I am also concerned that I am getting offloaded out of the system and forgotten about and I am going to end up worse that what I started with.</td>
<td>Oh in the meantime I had been told there was no infection, they had done the test and there was no infection</td>
</tr>
<tr>
<td>Feeling he was ignored, not considered important</td>
<td>Changing information</td>
</tr>
<tr>
<td>Unwanted / unvalued</td>
<td>Not receiving medical attention whilst in hospital led to an expression of isolation.</td>
</tr>
<tr>
<td>Positive care experience</td>
<td>Good outcome</td>
</tr>
<tr>
<td>Loss of control of events within recovery</td>
<td>Symptoms and previous experiences led to a belief that same situation was occurring again</td>
</tr>
<tr>
<td>Labelled by healthcare professional</td>
<td>Previous experiences and recollection of these experiences triggers worry</td>
</tr>
</tbody>
</table>
went wrong, err from the point of view that I had again after a
week of getting home I developed an abscess at the end of the
scar with quite a lot of discharge and that on its own with
antibiotics took 4 months to heal, well 4-5 months to heal
and fear about what is happening

When you come back in again and know you have got an
infection that is an absolute nightmare. You know I was.. I can, there are no words to explain how I felt.

Dread as experiences are repeated

How I got the infection I won’t know.

Unanswered questions

Only two operations I have had an infection and the only two
operations where I have had a catheter fitted.

Significant event

I was really, and it was painful, don’t get me wrong it was
extremely painful, but I was not just frightened, umm I can’t say the word really but I was not annoyed with myself or anybody
else but I couldn’t umm couldn’t go through another 4or 5
months having an infection like my AAA one

Despair at what was perceived to lie ahead

But umm it was a nightmare (awkward laugh) especially when
you have previously had an infection.

Negative feelings towards experience

the antibiotics (Laughs) not quite nice, umm I suffered more
having to go to the toilet more,

Treatment produced unpleasant side effects

I would like to say is thank you everyone for their prompt action
really in sorting it out.

Still considers treated well

It is nice to get mobile again

Positive outcome after negative event

<table>
<thead>
<tr>
<th>Interview 9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having seen the x ray and how much pain I was in I understood why I needed umm a knee replacement because it was, it looked quite nasty</td>
</tr>
<tr>
<td>Understanding why surgery was necessary eased process</td>
</tr>
</tbody>
</table>

| The nurses were absolutely brilliant and they looked after me the whole time. |
| Positive care experience |

| I must have had the infection straight away because it literally started the next day. With yellow fluid coming out and they obviously checked it and said we will see how it goes and then i had a cannula in and I had some antibiotics, yes umm some antibiotics every six hours |
| Symptoms and then treatment led pt to believe they had an infection |

| yes, because obviously they couldn’t let you out until the infection gone, that the sort of thing I heard |
| Being treated as pt expected someone with an infection to be treated led them to believe they were infected |

| I did feel very trapped when I was in hospital, |
| Loss of control |

| they were absolutely brilliant the nurses, they were completely cleanly, cleanliness was fantastic |
| Positive care experience |

| Umm the only thing was, normally like you say it is three to four days here and I was in for three weeks. So I was a bit, near to the end I was getting a bit depressed. I was quite upset, in tears all the time |
| Extensive in patient stay led to feelings of depression |

| I just wanted to be at home where I could relax and try and get some sleep, |
| Unable to control the environment |

| I cannot fault the nurses, at all they were all brilliant, the cleaners as well were all nice people. We watched them do the cleaning. You know we couldn’t fault the cleaning |
| Cleanliness of ward not cause of infection |

| The physios were really good; |
| Positive care experience |

| So overall I was looked after extremely well I was informed at all times you know and kept in comfort it was absolutely brilliant. |
| Even though considered developed an infection, overall experience was considered good. |
Appendix 12
Formulated Meaning Aggregated Into Themes

- Extensive in patient stay led to feelings of depression
- Unable to control the environment
- Despair at what was perceived to lie ahead
- Unanswered questions
- Previous experiences and recollection of these experiences triggers worry and fear about what is happening
- Dread as experiences are repeated
- Unwanted patient
- Fear for the future
- Feeling he was ignored, not considered important
- Loss of control of events within recovery.
- Not receiving medical attention whilst in hospital led to an expression of isolation
- Trying to take control of the situation
- Context in which this presented was that of despair
- Loss of control of situation
- Uncertainty regarding progress causes worry about function
- Infection caused additional pressure individual was unable to cope with
- Poor explanation of what the healthcare professionals concern were led individual to speculate, causing worry
- No explanation of what the concerns were left a feeling of worry and uncertainty regarding progress
- Feels a burden to others due to reduced mobility
- Uncertainty of outcome
- Comparison to others/ benchmarking
- Fluctuating ability leads to uncertainty/vulnerability
- Uncertain of expectations caused by comparison to others
- Lack of information
- Loss of function inability to cope
- Trust turns to loss of trust as events take negative turn
- Burden to others

Vulnerability

- Significant event
- Significant event/legitimate worry

Significant Event
• Cleanliness/ providing a caring environment
• Positive care experience
• Concept of caring
• Good outcome
• Understanding why surgery was necessary eased process
• Still considers treated well
• Negative feelings towards experience
• Positive outcome after negative event
• Cleanliness of ward not cause of infection
• Even though considered developed an infection, overall experience was considered good
• Treatment produced unpleasant side effects
• Felt unvalued within the system
• Healthcare practitioners concern not reciprocated by the doctor
• Reassurance from expert
• Following on from experience, offering ways of improving the service
• Grateful for success
• Felt to be not valued/ considered important
• Lack of information
• Reassurance by process
• Following on from experience, offering ways of improving service

• Changing information
• Healthcare professionals continually changing their mind about how they are going to treat. Going back and forth between different doctors
• Changing opinion with different healthcare professionals/ conflicting information
• This uncertainty about different doctors think is his treatment plan, pt is losing faith in service
• Differing opinion from another doctor leads to expressions of frustration
• Considered this was being told he had an infection but responsibility was being passed on
• Provision of information appears to vary between healthcare professionals
• General Practitioner seeks expert opinion

Pendulum of Care
YoYoing
• Symptoms and then treatment led pt to believe they had an infection
• Being treated as pt expected someone with an infection to be treated led them to believe they were infected
• Symptoms and previous experiences led to a belief that same situation was occurring again
• Labelled by healthcare professional
• Presenting previous experience to set the scene
• Symptoms not matching preconceptions of what the experience of infection should present as.
• Outcome different to expectations so assumption made there was an infection
• Symptoms patient associated with infection
• Pt didn’t feel unwell so how could she have an infection
• Labelled as infected
• Patient labels himself based on what he perceives I would call what was happening to him

Perception of infection
Appendix 13
Learning Objectives

In relation to the course work:
1. To develop a more in-depth understanding of statistics including the terminology and appropriate use of statistical tests
2. To be able to use various forms of statistical software (i.e. excel and SPSS) to generate a range of statistical analyses.
3. To be able to use software package to manage references and generate reference lists.
4. Refine my critical reflection skills, exploring different models of reflection, and be able to translate them in practice.
5. Being able to develop my own academic analytical skills to meet the Professional Doctorate level
6. To produce work suitable for publication.
7. To develop a greater understanding of a variety of research methodologies and be able to identify the most appropriate one to use in my research project.

In relation to the Thesis:
1. To grasp, without fear, the depth of study /project required for this level of study.
2. To produce innovative and relevant work that is transferable to the workplace.
3. To define the research question, giving appropriate rationale for the research methodology proposed.
4. To gain a greater understanding of the organisms that are most commonly found in joint replacements, how they are treated, and develop ways of exploring the different methods that can be used to help reduce infections in this patient group.
5. To understand, and utilise in practice, a range of change management tools that can be used effectively within the multi-professional, interdisciplinary healthcare arena.

Self and Environmental Assessment

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have a good working relationship with the clinicians in my department</td>
<td>Not worked at this academic level before. Need to grasp understanding of level of skills required</td>
</tr>
<tr>
<td>I have the support of senior management</td>
<td>Fear of failure</td>
</tr>
<tr>
<td>I am a very self motivated enthusiastic person</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunities</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop support networks with other students and tutors</td>
<td>There are constraints on my time for me to be released for educational development</td>
</tr>
<tr>
<td>Access open sessions for student support through the university network</td>
<td>Time needs to be devoted to supporting new staff</td>
</tr>
<tr>
<td>Chance to challenge own preconceptions and ideals in a safe environment</td>
<td>I work fulltime and have to juggle work and studying with family commitments</td>
</tr>
</tbody>
</table>

Available resources:
The Clinical Team within the unit
The Library Services
The University support network
Other Students on the same course

Evidence of Learning Achievement

- A Portfolio of evidence that will demonstrate the processes used to achieve the learning outcomes
- Successful completion of the research unit incorporating the evidence to demonstrate sound understanding of statistical methodologies and terminology.
- Demonstration, within the portfolio, of the ‘development in use’ of different models of reflection
- Successful completion of the modules incorporated in stage 1 of part 2 of the doctorate programme.
- Have a piece of work accepted for publication
- Evidence of the development of a sound research question on which to base my thesis. Demonstrated by agreement to proceed with my research proposal

Utilizing the SWOB Analysis

<table>
<thead>
<tr>
<th>SWOB Issue</th>
<th>Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have a good relationship with the clinical team</td>
<td>I can utilize this to gain support for the project</td>
</tr>
<tr>
<td>Not worked at this academic level before</td>
<td>Utilise all available resources and tutorial support</td>
</tr>
<tr>
<td>Fear of failure</td>
<td>Identification of issues that are unfamiliar /cause fear and exploration of these to highlight areas for future development</td>
</tr>
<tr>
<td>Working fulltime and juggling working, studying and family</td>
<td>Ensure that there is an appropriate allocation of time to maintain a healthy equilibrium between them all.</td>
</tr>
</tbody>
</table>