Case study 10 - Hysterectomy
Hospital costs and outcomes study for NSW Health

Other Industries
July 2010
Case study 10 - Hysterectomy

Independent Pricing and Regulatory Tribunal of New South Wales
PO Box Q290, QVB Post Office NSW 1230
Level 8, 1 Market Street, Sydney NSW 2000
T (02) 9290 8400 F (02) 9290 2061
www.ipart.nsw.gov.au

© Independent Pricing and Regulatory Tribunal of New South Wales 2010.
This work is copyright. The Copyright Act 1968 permits fair dealing for study, research, news reporting, criticism and review. Selected passages, tables or diagrams may be reproduced for such purposes provided acknowledgement of the source is included.

ISBN 978-921628-57-3 S9-56

The Tribunal members for this review are:

Mr James Cox, Acting Chairman and Chief Executive Officer
Ms Sibylle Krieger, Part Time Member

Inquiries regarding this document should be directed to a staff member:
Alison Milne (02) 9290 8443
Bee Thompson (02) 9290 8496
Contents

1 Introduction and executive summary 1
   1.1 Why did we select hysterectomy as one of the case studies? 4
   1.2 What was the scope of the hysterectomy case study? 4
   1.3 What were the key findings of the hysterectomy case study? 5
   1.4 What are the key implications of these findings? 9
   1.5 List of recommendations 10
   1.6 What does the rest of this report cover? 10

2 Main types of hysterectomy procedures and hysterectomy patients 11
   2.1 Type of hysterectomy procedures and the conditions treated 11
   2.2 Choice of procedure at the study hospitals 13
   2.3 Hysterectomy is an area of declining activity 13

3 Number and mix of patients across study hospitals 15
   3.1 Number of hysterectomy cases at study hospitals 15
   3.2 Age of patients 17

4 Comparison of lengths of stay 18
   4.1 Comparing length of stay for all hysterectomy cases 18
   4.2 Comparing length of stay by surgical procedure 20
   4.3 Variation between physicians in episode length of stay 21

5 Costs of providing inpatient care 24
   5.1 Cost of nursing staff in wards 24
   5.2 Imaging costs 32
   5.3 Pathology costs 33
   5.4 Blood use costs 34
   5.5 Operating theatre time and costs 35

6 Configuration of care 38

7 Outcome, safety and quality indicators 40
   7.1 How we developed a set of clinical indicators 40
   7.2 Analysing indicators and risk-adjusting for patient characteristics 41
   7.3 List of clinical indicators for hysterectomy and their availability 42
Appendices
A  List of full recommendations from main report 47
B  Risk-adjusted indicators provided by NSW Health 57

Glossary 58
1 Introduction and executive summary

NSW Health is currently coordinating a project that ultimately aims to improve clinical practice and efficiency consistently across the NSW hospital system. The project involves 6 components, and is designed to enable development of a methodology that makes better use of available data to compare patient mix, costs, clinical practice and outcomes and which can then be applied across other hospitals to improve performance (see Box 1.1 for more information).

NSW Health asked the Independent Pricing and Regulatory Tribunal of NSW (IPART) to conduct a costs and outcomes study that encompasses 3 components of this larger project. The aim of the study was to provide information and analysis that can be used by clinical experts to better understand the variation in clinical practice in NSW hospitals, and the extent to which this variation can lead to differences in hospital costs and clinical outcomes.

IPART’s study involved comparing costs, configurations of care and outcomes in 5 selected NSW hospitals:
- Royal Prince Alfred Hospital (RPAH)
- Royal North Shore Hospital (RNSH)
- John Hunter Hospital (JHH)
- Bankstown-Lidcombe Hospital (BLH), and
- Gosford Hospital (GH).

To do this, we analysed management practices at the hospital-wide level and did detailed case studies of 11 specific clinical areas. As costs, configurations of care and relevant indicators of outcomes vary significantly depending on the condition of the patient and/or the procedure undertaken, these case studies allowed us to compare the hospitals on a more like-with-like basis. This document discusses our findings in one of these 11 clinical areas – hysterectomy. (See Box 1.2 for the full list of clinical areas we examined, how they were selected, and how we conducted the case studies.)
**Box 1.1 NSW Health Project**

IPART’s hospital costs and outcomes study is part of a larger, multi-stage project NSW Health is coordinating with the assistance of other organisations. The terms of reference for this project set out 6 components:

1. Audit the quality of current coding and costing data.
2. Analyse differences in costs between 3 principal tertiary referral hospitals and 2 other principal referral hospitals.
3. Describe the different configurations of care that underpin different cost profiles.
4. Analyse available data on differences in adjusted admission rates and clinical outcomes for the 5 selected hospitals.
5. Determine whether variations in configurations of care lead to different clinical outcomes.
6. Identify the extent to which clinical variation exists, with the aim of achieving clinical best practice and maximum efficiency.

The first component is being completed by Health Outcomes International (audit of costing) and Pavilion Health (audit of coding). The results will assist the NSW Department of Health in further developing episode funding, in line with the national agreement by COAG to move to a more nationally consistent approach to activity-based funding. IPART has completed the second, third and fourth components through our hospital costs and outcomes study. The results of this study will be used by clinical experts in completing the fifth and sixth components.

The NSW Health project is part of its response to the findings and recommendations made in the *Report of the Special Commission of Inquiry into Acute Care Services* by Commissioner Garling.

Flowing from the NSW Government’s response to the Garling Inquiry (*Caring Together - The Health Action Plan for NSW* (2009)), ‘four pillars’ of clinical improvement have been established – Clinical Excellence Commission (CEC), Agency for Clinical Innovation (ACI), Bureau of Health Information (BHI) and Clinical Education and Training Institute (CETI). IPART’s analysis on costs, clinical practice and outcomes is to be considered by the NSW Department of Health and clinical experts in these agencies to assess whether variations in configurations of care lead to different clinical outcomes and to identify the extent to which clinical variation exists, with the aim of achieving clinical best practice and maximum efficiency.
To compare costs, configurations of care and outcomes in the 5 study hospitals, we focused on 11 specific conditions or procedures in detail (as well as undertaking a broad, hospital-wide analysis). These conditions/procedures are:

- Hip joint replacement
- Major chest procedures
- Breast surgery
- Cholecystectomy
- Appendicectomy
- Stroke
- Cardiology – stents, pacemakers and defibrillators
- Tracheostomy, or ventilation for greater than 95 hours
- Cataract/lens procedures
- Hysterectomy, and
- Obstetric delivery.

In selecting these conditions/procedures, and the relevant indicators to compare for each, we were advised by a clinical consultant (Dr Paul Tridgell) and a clinical reference group (Professor Bruce Barraclough, Dr Anthony Burrell, Dr Patrick Cregan, Professor Phillip Harris, Professor Clifford Hughes, Professor Brian McCaughan, Professor Peter McClusky, Dr Michael Nicholl, Professor Ron Penny, Professor Carol Pollock and Dr Hunter Watt).

The case studies were selected to provide a range of surgical procedures and a range of medical conditions that met one or more of the following criteria:

- high volumes
- high reported costs
- high variability in reported costs
- apparent differences in clinical practice, or
- a range of models of care.

To conduct the case studies, we visited each of the hospitals and spoke with a range of staff, including clinical, nursing, management, finance, coding and administrative staff. We also collected a range of clinical and financial data from NSW Health, relevant area health services and hospitals. By analysing the data and speaking with clinical experts, we established the most suitable data available for comparing hospitals on a like-with-like basis.

For further information on our methodology and broad findings on costs, outcomes and configurations of care, see our report *NSW Health costs and outcomes study by IPART for selected NSW hospitals*. Our detailed findings on the other case study areas can be found in our reports on each area.
1.1 Why did we select hysterectomy as one of the case studies?

Hysterectomy was selected as one of the clinical areas for detailed study because it involves:

- moderate volumes
- large differences in reported costs between hospitals despite a relatively uniform patient type and similar length of stay
- apparent differences in clinical practice (e.g., surgical approach taken to perform the hysterectomy).

1.2 What was the scope of the hysterectomy case study?

The hysterectomy case study compared the costs and configurations of care related to this surgical procedure. We used diagnostic related groups (DRGs) to define the procedures and identify the data included in the scope of the case study. This case study involved a single DRG (see Table 1.1).

Table 1.1 DRGs included in the scope of the hysterectomy case study

<table>
<thead>
<tr>
<th>DRG</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N04Z</td>
<td>Hysterectomy for non malignancy</td>
</tr>
</tbody>
</table>

For this case study, we found that it was necessary to go beyond DRGs and we identified subgroups of patients based on the principal type of surgery performed ('principal procedure') to meaningfully compare costs, configurations of care and outcomes. See Chapter 2 for further details.

Unless specified otherwise in this case study, the data we analysed related to the 12-month period from 1 July 2008 to 30 June 2009.

---

1 In 2007/08, 26,073 hysterectomies were undertaken in Australian hospitals. See Australian Institute of Health and Welfare, AR-DRG Data Cubes, Separation, patient day and average length of stay statistics by Australian Refined Diagnosis Related Group (AR-DRG) Version 5.0/5.1, Australia, 1998-99 to 2007-08. http://d01.aihw.gov.au/cognos/cgi-bin/ppdscgi.exe?DC=Q&E=/AHS/drgv5_9899-0708_v2)

2 Case allocation to a DRG is based on a combination of administrative patient data and 2 key classification systems: the International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Australian Modification (ICD-10_AM) for diagnoses and the Australian Classification of Health Interventions (ACHI) for procedures. The classification edition current during the 2008/09 period was the 6th Edition. For the purpose of this study, the term DRG is synonymous with AR-DRG 5.2.
1.3 **What were the key findings of the hysterectomy case study?**

To compare the costs and configurations of care for hysterectomies at the study hospitals, we collected, analysed and compared data on:

- the type, number and mix of hysterectomy patients at each hospital
- the average length of stay for these patients at each hospital
- selected costs, or major clinical resources used to provide acute inpatient care for these patients at each hospital
- the configurations of care used to provide and manage hysterectomy patient care at each hospital
- indicators of outcome, safety and quality for hysterectomies for each hospital.

Our key findings are summarised below.

1.3.1 **Types of hysterectomy procedures**

As noted above, we found it was necessary to go beyond the DRG level to identify groups of reasonably similar patients. Therefore, we broke the data into 4 subgroups based on the principal type of hysterectomy procedure performed. These subgroups, which have different implications for costs and length of stay, were abdominal, laparoscopic, vaginal and laparoscopically-assisted vaginal hysterectomy.

Abdominal surgery is the oldest method and has the longest length of stay. Vaginal hysterectomy is not feasible for patients with a very large uterus.

We found that about 50% of patients in the study hospitals had abdominal surgery in 2008/09, and about 34% had vaginal surgery. BLH had the highest rate of abdominal surgery (62% of cases), and RNSH had the lowest (44% of cases).

We found that the choice of procedure depends partly on the condition to be treated, but also on the skills and preferences of the clinical staff.

We also found that hysterectomy is an area of declining activity because hysterectomies are increasingly being replaced by less invasive procedures such as endometrial ablation\(^3\) and uterine artery embolisation\(^4\).

---

\(^3\) Endometrial ablation is a process that destroys the lining of the uterus, and is used to treat uterine bleeding (WebMD, [http://women.webmd.com/endometrial-ablation-16200](http://women.webmd.com/endometrial-ablation-16200)).

\(^4\) Uterine artery embolisation is used to treat uterine fibroids by blocking both uterine arteries with particles injected via the femoral and uterine arteries (National Institute for Health and Clinical Excellence, [http://www.nice.org.uk/IPG94](http://www.nice.org.uk/IPG94)).
1.3.2 Number and mix of patients

Our analysis shows that the average age of patients in all hospitals was 51 years old, with only a small amount of variation between the hospitals. Almost all hysterectomies were planned rather than emergency admissions.

We found that RNSH had a relatively low volume of hysterectomy cases relative to its size, which probably reflects the volume of private cases undertaken in nearby private facilities. GH had a high number of hysterectomies relative to its size.

1.3.3 Average length of stay

Our analysis indicates that the measure often used in National Hospital Cost Data Collection (NHCDC) and DRG benchmarking – the average ‘acute episode length of stay’, is appropriate for the hysterectomy DRG because there were very few transfers in or out of the study hospitals, and very few patients that recorded more than one acute episode. We have reported only the acute episode length of stay (LOS1).

We found that RNSH has the highest 23 hour surgery rate and the highest proportion of 1 or 2 day stays. GH has a shorter average length of stay, but this is because it has a significantly smaller share of stays of more than 4 days. The comparatively long average length of stay at RPAH and JHH is largely due to a small number of cases at these hospitals with a length of stay exceeding 7 days. We also found that the average length of stay is higher for abdominal hysterectomies than for vaginal hysterectomies.

Finally, we found that there is a great deal of variation between treating physicians in length of stay of their patients and the proportion of patients staying for only 1 or 2 days.

1.3.4 Costs of inpatient care

To compare the costs related to the case study areas at the study hospitals, we examined the management and use of a selection of clinical resources used directly for patient care in that area. For hysterectomy, the main clinical resources we examined were nursing staff in wards, imaging, pathology, blood use, and operating theatre time. We had aimed to also estimate medical staff costs and pharmacy costs for this case study, but were unable to obtain consistent comparisons within the timeframe for this review.5

We separated costs for abdominal versus vaginal hysterectomies in our analysis of direct nursing costs, blood use and operating theatre time, but did not break down the hysterectomy cases into subgroups for our estimates of pathology or imaging costs.

5 Medical staffing and pharmacy are discussed in our main report, NSW Health costs and outcomes study by IPART for selected NSW hospitals, July 2010, Chapters 9 and 14.
Cost of nursing staff in wards

We found that the number of nursing hours per patient day (ie, the nursing staff-to-patient ratio) is the main driver of the differences in the average cost per episode for this DRG as a whole, partly because the length of stay is fairly uniform across the hospitals (except JHH). However, we found that the average length of stay drives the cost difference between different surgical procedures within each hospital.

We found that a more senior nursing staff mix – Clinical Nurse Specialists (CNSs) and Registered Nurses (RNs) – was associated with fewer nursing hours per patient day and a lower nursing cost per patient day. In particular, we found that JHH had the lowest cost per patient day and the highest proportion of CNSs and RNs in its staff mix, while BLH had lowest proportion of CNSs and RNs in its staff mix and the highest cost per patient day.

The hospitals use inpatient fractions (IFRACs) to allocate staff time to acute care and other staff responsibilities. We found that nursing costs are highly sensitive to the IFRACs the hospitals apply to them. When all nursing costs are attributed to inpatient care (ie, IFRAC=1), the cost variation between the hospitals is significantly smaller than when the hospital’s IFRACs are used. Setting IFRAC equal to 1 increased RNSH costs the most, and changed its ranking from the lowest cost hospital to the highest cost hospital (excluding RPAH).

Imaging, pathology and blood use costs

We found that imaging costs for this DRG were low at all the hospitals – less than $50 per episode. Blood use costs were also low and ranged from $24 per episode at RNSH to $91 per episode at BLH. Blood use was much higher for abdominal hysterectomies than for vaginal hysterectomies.

Pathology costs ranged between $221 and $276 at all the hospitals except GH, where the cost was significantly lower, at $87 per episode. It appeared that the GH pathology data excluded many item numbers for the higher cost tests, which accounted for the difference. We believe that these tests were performed at another lab and not captured in the hospital imaging data. All the study hospitals did a significant proportion of these tests on the day of admission.

6 We excluded RPAH from this analysis because the gynaecology ward moved during the year, making the costs unreliable.
Operating theatre times

We analysed operating theatre time for the various hysterectomy procedures. We cannot directly compare our analysis of operating theatre times with the NHCDC operating theatre costs, because the NHCDC costs include items that are not related to time spent in surgery (such as goods and services and some anaesthetic department costs). However, we found that there is a significantly wider variation in the NHCDC costs than in operating theatre times.

National Hospital Cost Data Collection

The NHCDC reports estimates of average hospital costs based on data it collects from hospitals around Australia. In this study, we had access to the study hospitals’ provisional de-identified patient-level data for 2008/09, as well as the overall averages publicly reported by the NHCDC for different hospital groupings in 2007/08. The final NHCDC estimates for study hospitals for 2008/09 became available towards the end of our study. We compared these to the provisional costs and found that some of the costs had changed substantially. Given the limited time available, we used the final costs only where these were substantially different from the provisional costs.

We were able to compare study hospitals’ NHCDC estimates with our estimates of nursing, imaging and pathology costs. For pathology we used the final NHCDC costs. We found there is a much smaller variation in our nursing costs across the study hospitals than is implied by the NHCDC costs. We also found a higher degree of consistency in the hospitals’ use of imaging and pathology than is reflected in the NHCDC. Finally, we found that the NHCDC operating theatre costs vary over a far wider range than differences in operating theatre time would indicate.

1.3.5 Configurations of care

Due to time constraints, we did not have detailed discussions about configurations of care for hysterectomies during our hospital visits.

However, we make the observation that JHH, RNSH and RPAH have specialist gynaecology oncology units. These hospitals may have a more complex casemix because some patients admitted through these units may be coded into this DRG (N04Z - hysterectomy for non-malignancy). For example, we found a number of cases with diagnoses like ‘carcinoma in situ of cervix, unspecified’ who were included in this DRG.

---

7 NSW Health, Program and Product Data Collection Standards Product costing standards v1.0, Reporting requirements v1.0, 2008/09, p 83.
8 In NSW, these cost estimates are often compiled by area health services, rather than individual hospitals.
1.3.6 Outcome indicators

NSW Health provided risk-adjusted 30-day mortality rates to compare hospital outcomes for hysterectomy patients. Their analysis found that there were fewer than 5 deaths following hysterectomies in the 5 hospitals over the 3-year period 2005/06 to 2007/08. The number of deaths was too small to allow comparisons between the hospitals.

1.4 What are the key implications of these findings?

DRG N04Z is not a uniform grouping but the differences are small compared with other clinical conditions

Benchmarking studies of the performance of individual hospitals and the public and private hospital sectors often use DRGs as the basis for comparing length of stay and cost. This assumes that patients whose condition or procedure has been coded with the same DRG are relatively similar. Models of casemix or episode-based funding are based on similar assumptions.

The hysterectomy DRG does not recognise the complexity introduced by the range of different conditions that hysterectomies are used to treat, and the different surgical procedures that can be used. Ideally, comparisons between the hospitals should take into account both of these factors. However, we note that the variations in length of stay and cost between the different surgical procedures and hospitals are small compared with DRGs for other clinical conditions, for example those for hip joint replacement or major chest procedures.\(^\text{10}\)

Nursing staff mix

A higher share of RNs and CNSs does not necessarily mean higher nursing costs. A more senior staff mix can means that fewer nursing hours are required.

Further work on alternative procedures to hysterectomy

Hysterectomy is an area of declining activity because hysterectomies are increasingly being replaced by more conservative procedures such as endometrial ablation and uterine artery embolisation. Future comparisons by NSW Health or hospitals could compare the costs and configurations of care for these other procedures, and the extent to which they are used instead of hysterectomies.

\(^\text{10}\) See Case study 2 Major chest procedures Hospital costs and outcomes study for NSW Health and Case study 1 - Hip joint replacement - Hospital costs and outcomes study for NSW Health.
1.5 List of recommendations

That any future studies of hysterectomy compare the costs and outcomes for hysterectomies with the costs and outcomes of other procedures such as endometrial ablation and uterine artery embolisation.

1.6 What does the rest of this report cover?

The rest of this report discusses the findings of the hysterectomy case study in more detail:

- Chapters 2 and 3 discuss the main types of hysterectomy procedures and the number and mix of patients at the study hospitals.
- Chapter 4 compares the length of stay at the study hospitals, and analyses the length of stay by treating physician.
- Chapter 5 describes how we analysed the costs of hysterectomies by identifying the main clinical resources used to provide inpatient care, then estimating and comparing the level of each resource used at the study hospitals. It also compares our cost estimates with estimates based on the provisional or final data reported to NSW Health as part of the NHCDC.
- Chapter 6 makes some general observations about configurations of care. Due to time constraints we did not have detailed discussions about configurations of care for hysterectomies during our hospital visits.
- Chapter 7 discusses the indicators of outcome, safety and quality for hysterectomy we identified as clinically meaningful. It then compares the available data on these indicators across the study hospitals.
- The appendices contain the complete list of recommendations for our hospital costs and outcomes study, more detailed information on the data sources for risk-adjusted outcome indicators and the glossary.
Main types of hysterectomy procedures and hysterectomy patients

To meaningfully compare data on the costs, configurations of care and outcomes for a particular condition or procedure, the patients to which the data relate must be reasonably similar - to allow 'like-with-like' comparisons. As Chapter 1 discussed, the hysterectomy case study includes a single DRG to identify clinical and financial data related to patients who had undergone hysterectomies at the study hospitals. However, our analysis of the data and discussions with clinicians indicates that there is a diverse mix of patients within this DRG and several types of hysterectomy procedures are performed.

Patients undergo hysterectomies to address a range of medical conditions, and their care requirements can be very different depending on their principal diagnosis. This influences the configurations of care, associated costs and outcomes.

For this case study, we could not separate the data on hysterectomies into subgroups by diagnosis because there were such a large number of diagnoses related to this procedure. However we did separate the data into subgroups based on the type of hysterectomy procedure performed, which enabled further analysis of the different care requirements associated with different procedures. The sections below list the main types of hysterectomy patients and the main hysterectomy procedures.

2.1 Type of hysterectomy procedures and the conditions treated

There are four main types of hysterectomy procedures, which have different implications for costs and length of stay.\textsuperscript{11} These are:

\begin{itemize}
  \item Abdominal surgery, which involves an incision through the abdominal wall. This is the oldest method, and involves the longest hospital length of stay of about 5 days.
  \item Laparoscopic hysterectomy, which involves 3 to 4 small incisions through the abdominal wall. This method reduces the length of stay to around 3 days, but is capital intensive in terms of the equipment used for the procedure.
  \item Vaginal hysterectomy, which is performed entirely through the vaginal canal. This method has the shortest length of stay of 1 to 2 days.
\end{itemize}

\textsuperscript{11} Comparisons of length of stay are discussed in Chapter 4. Length of stay estimates were also provided by some study hospitals during the hospital visits, namely RNSH.
Main types of hysterectomy procedures and hysterectomy patients

- Laparoscopically-assisted vaginal hysterectomy, which is also performed through the vaginal canal but with the assistance of a laparoscope inserted through small incisions in the abdominal wall.\(^\text{12}\)

Hysterectomy in this DRG is used to treat a number of different conditions, which include:\(^\text{13}\)

- Fibroids, which are non-cancerous, muscular tumours that grow in the wall of the uterus.
- Endometriosis, when the tissue that lines the uterus grows outside the uterus.
- Prolapse of the uterus, the uterus slips from its usual place down into the vagina.
- Adenomyosis, when the tissue that lines the uterus is present inside the walls of the uterus.
- Chronic pelvic pain, for which surgery may be a last resort.
- Abnormal vaginal bleeding.
- Very rarely, hysterectomy is needed to control bleeding during a caesarean delivery.\(^\text{14}\)

The choice of procedure depends partly on the clinical condition to be treated. For example, vaginal procedures tend to deal with prolapse of the uterus while abdominal surgery may be required when complications are expected or surgical exploration is required. Vaginal hysterectomy is not feasible for patients with a very large uterus (for example due to large fibroids). Laparoscopic procedures are more appropriate to control bleeding.

But the choice of procedure may also depend on the skills and preferences of the clinical staff. For example, we were advised that at RNSH there tend to be more laparoscopic procedures due to the skill mix of the staff who often only do gynaecological work. Clinicians who do vaginal and abdominal procedures tend to cover obstetrics and gynaecology, as well as having more cases relating to malignancy and pelvic floor problems.


\(^{13}\) Hysterectomy is also used to treat cancer of the uterus, ovary, cervix, or endometrium, but these cases fall under a different DRG.

\(^{14}\) US Department of Health and Human Services, (http://www.womenshealth.gov/faq/hysterectomy.cfm#b).
2.2 Choice of procedure at the study hospitals

In 2008/09, about 50% of patients at the study hospitals had an abdominal hysterectomy and 34% had a vaginal hysterectomy (see Table 2.1). BLH had the highest rate of abdominal surgery (62% of cases), and RNSH had the lowest (44% of cases). RNSH had the highest rate of laparoscopically assisted vaginal surgery (21% of cases compared with less than 10% of cases at the other hospitals).

Table 2.1 Proportion of hysterectomies by type of procedure

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Abdominal</th>
<th>Vaginal</th>
<th>Laparoscopic</th>
<th>Laparoscopically-assisted vaginal</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>RPAH</td>
<td>53</td>
<td>32</td>
<td>6</td>
<td>8</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>GH</td>
<td>46</td>
<td>46</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>RNSH</td>
<td>44</td>
<td>27</td>
<td>4</td>
<td>21</td>
<td>4</td>
<td>100</td>
</tr>
<tr>
<td>BLH</td>
<td>62</td>
<td>25</td>
<td>0</td>
<td>8</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>JHH</td>
<td>49</td>
<td>35</td>
<td>7</td>
<td>8</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>All study</td>
<td>50</td>
<td>34</td>
<td>5</td>
<td>9</td>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>hospitals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: ‘Other’ consists of those cases which did not have a procedure code for an abdominal, vaginal, laparoscopic or laparoscopically-assisted vaginal hysterectomy. Totals may not add up due to rounding.

Source: HIE inpatient statistics, 2008/09 and IPART analysis.

2.3 Hysterectomy is an area of declining activity

Hysterectomy is an area of declining activity because hysterectomies are increasingly being replaced by more conservative procedures such as endometrial ablation and uterine artery embolisation. In NSW, there was a decline in activity of 15% in Australian hospitals between 1998/99 and 2007/08.15

Future comparisons by NSW Health or hospitals could compare the costs and configurations of care for these other procedures, but we have not done so in this study. Table 2.2 shows the number of endometrial ablation and uterine artery embolisation procedures carried out at the study hospitals in 2008/09, as well as the number of hysterectomy cases for comparison. Endometrial ablation was a fairly common procedure in our study hospitals, particularly at GH. Uterine artery embolisation was less commonly used.

Main types of hysterectomy procedures and hysterectomy patients

### Table 2.2 Number of endometrial ablation and uterine artery embolisation procedures

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Hysterectomy cases</th>
<th>Endometrial ablation procedures</th>
<th>Uterine artery embolisation procedures[^a]</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPAH</td>
<td>200</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>GH</td>
<td>101</td>
<td>82</td>
<td>1</td>
</tr>
<tr>
<td>RNSH</td>
<td>52</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>BLH</td>
<td>52</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>JHH</td>
<td>204</td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td>All study hospitals</td>
<td>609</td>
<td>134</td>
<td>20</td>
</tr>
</tbody>
</table>

[^a]: The number of Transcatheter embolisation of blood vessels, pelvis, procedure code 35321-06, on patients in N07Z ("Other uterine and adnexa procedures for non-malignancy").

*Source:* HIE inpatient statistics, 2008/09 and IPART analysis.
3 Number and mix of patients across study hospitals

We identified the total number of hysterectomy cases at each hospital during the study period and the proportion of these that were emergency admissions. We then compared the age of patients at each hospital.

We found that the number of hysterectomy procedures performed at the study hospitals varied significantly. Specifically, we found that RNSH performed relatively few hysterectomies, possibly reflecting the volume of private cases undertaken in nearby private facilities. We found little variation in the average age of patients.

The sections below discuss our analysis of patient numbers and the age of patients in more detail.

3.1 Number of hysterectomy cases at study hospitals

Table 3.1 provides a comparison of the total number of hysterectomies performed at the study hospitals in the selected DRG, as well as the type of procedure performed. Our data indicates that there were 609 patients who had hospital stays for hysterectomies in the hospitals during 2008/09 and about half of these had abdominal procedures.¹⁶

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Abdominal</th>
<th>Vaginal</th>
<th>Laparoscopic</th>
<th>Laparoscopically assisted vaginal</th>
<th>Other</th>
<th>Total stays</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPAH</td>
<td>106</td>
<td>63</td>
<td>11</td>
<td>16</td>
<td>4</td>
<td>200</td>
</tr>
<tr>
<td>GH</td>
<td>46</td>
<td>46</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>101</td>
</tr>
<tr>
<td>RNSH</td>
<td>23</td>
<td>14</td>
<td>2</td>
<td>11</td>
<td>2</td>
<td>52</td>
</tr>
<tr>
<td>BLH</td>
<td>32</td>
<td>13</td>
<td>-</td>
<td>4</td>
<td>3</td>
<td>52</td>
</tr>
<tr>
<td>JHH</td>
<td>100</td>
<td>72</td>
<td>15</td>
<td>16</td>
<td>1</td>
<td>204</td>
</tr>
<tr>
<td>All study hospitals</td>
<td>307</td>
<td>208</td>
<td>30</td>
<td>52</td>
<td>12</td>
<td>609</td>
</tr>
</tbody>
</table>

Note: See Box 3.1 for details on how we calculated the number of cases.
Source: HIE inpatient statistics, 2008/09 and IPART analysis.

¹⁶ We have only included cases if the first episode of the admission has a DRG of N01Z to avoid counting any patients twice.
JHH and RPAH had similar numbers of cases at 204 and 200, respectively while GH had 101 cases. RNSH performed only 52 cases, as did BLH. This relatively low volume of cases at RNSH probably reflects the volume of private cases undertaken in nearby private facilities.

RPAH performed the most abdominal hysterectomies (106) while JHH performed the most vaginal hysterectomies (72). GH and BLH performed very few laparoscopic or laparoscopically-assisted vaginal hysterectomies.

Box 3.1 provides more detail on how we calculated the number of cases at each hospital.

**Box 3.1 How we calculated the number of hysterectomy cases**

To calculate the number of hysterectomy cases at the study hospitals, we:

- used patient episode data for 2008/09
- counted adjoining episodes as part of the same stay (ie, adjoining episodes counted as one case)
- only included patient data where the whole patient stay occurred within 2008/09 (ie, all episodes and adjoining episodes had to start on or after 1 July 2008 and end on or before 30 June 2009 to be counted)
- only included patient data where the first episode in the year in the study hospital was coded as a DRG for hysterectomy (ie, episode sequence number has to be 1).

The approach prevented double counting. It excluded patients that may be admitted for a different condition and later be reclassified to a hysterectomy DRG.

Note that our approach means that the number of cases we identified will be less than the number of separations in 2008/09.

**3.1.1 Admissions and transfers**

Almost all hysterectomies were planned admissions, and there were very few transfers in or out of the study hospitals (see Table 3.2).
Table 3.2 Transfers and emergency admissions for hysterectomy

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Transfers in %</th>
<th>Transfers out %</th>
<th>Emergency admissions %</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPAH</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>GH</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>RNSH</td>
<td>2</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td>BLH</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>JHH</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>All study hospitals</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Note: See Box 3.2 for details on how we identified emergency admissions and transfers.
Source: HIE inpatient statistics, 2008/09 and IPART analysis.

Box 3.2 How we identified emergency admissions and transfers

Emergency admissions were identified by linking emergency department attendance data with admitted patient data where the time of arrival and departure in the emergency department matched with the admission time.

Due to data quality issues with the transfer in and transfer out fields in the admitted patient data, transfers were calculated using a linkage key developed by the Australian Institute of Health and Welfare.

3.2 Age of patients

The average age of patients in all hospitals was 51 years old. Patients were on average oldest at RPAH (54 years) and youngest at GH (47 years). The youngest patient was 20 years old and the oldest was 90 years old (see Table 3.3). For the study hospitals combined, only 9% of patients were more than 70 years old and 6% were less than 35 years old.

Table 3.3 Average age of hysterectomy patients

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Average age years</th>
<th>Age range years</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPAH</td>
<td>54</td>
<td>20-90</td>
</tr>
<tr>
<td>GH</td>
<td>47</td>
<td>29-77</td>
</tr>
<tr>
<td>RNSH</td>
<td>52</td>
<td>30-86</td>
</tr>
<tr>
<td>BLH</td>
<td>52</td>
<td>34-90</td>
</tr>
<tr>
<td>JHH</td>
<td>49</td>
<td>27-85</td>
</tr>
<tr>
<td>All study hospitals</td>
<td>51</td>
<td>20-90</td>
</tr>
</tbody>
</table>

Note: Age at date of admission.
Source: HIE inpatient statistics, 2008/09 and IPART analysis.
4 | Comparison of lengths of stay

We examined the average length of stay of hysterectomy patients because it is one of the factors that influence the cost of an individual’s hospital care. This is because a large component of this cost is nursing care (and this cost increases with the length of stay). In addition, differences in length of stay can point to differences in casemix or clinical practice between hospitals.

For each of our clinical case studies we have calculated three different lengths of stay measures. These are LOS1, which is the acute episode length of stay; LOS2, which is the total length of stay in study hospital; and LOS3, which is LOS2 plus allowance for time in other hospitals - one transfer in and one transfer out.

However in the case of hysterectomies, the majority of patients have planned rather than emergency surgery and there are very few transfers in and out of the study hospitals. Almost all patients are discharged after the acute episode. This means that there is no observable difference in the acute episode length of stay (LOS1), the hospital length of stay (LOS2) and the total number of days in hospital (LOS3). The measure often used in NHCDC and DRG benchmarking – the average ‘acute episode length of stay’, is therefore appropriate for the hysterectomy DRG.

We found that RNSH has the highest 23 hour surgery rate and the highest proportion of 1 or 2 day stays. GH has a shorter average length of stay, but this is because it has a significantly smaller share of stays of more than 4 days. The comparatively long average length of stay at RPAH and JHH is largely due to a small number of cases at these hospitals with a length of stay exceeding 7 days. We also found that the average length of stay is higher for abdominal hysterectomies than for vaginal hysterectomies.

We found that there is a great deal of variation between treating physicians in length of stay of their patients and the proportion of patients staying for only 1 or 2 days.

4.1 Comparing length of stay for all hysterectomy cases

Table 4.1 compares the average length of stay for hysterectomy patients across the study hospitals, using the acute episode measure (LOS1).
Table 4.1  Acute episode length of stay for all hysterectomy patients

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Number of cases</th>
<th>Average length of stay</th>
<th>Number of cases with LOS &gt; 7 days</th>
<th>Average length of stay excluding cases with LOS &gt;7 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>no.</td>
<td>days</td>
<td>no.</td>
<td>days</td>
</tr>
<tr>
<td>RPAH</td>
<td>200</td>
<td>4.6</td>
<td>14</td>
<td>4.1</td>
</tr>
<tr>
<td>GH</td>
<td>101</td>
<td>3.6</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>RNSH</td>
<td>52</td>
<td>3.7</td>
<td>2</td>
<td>3.5</td>
</tr>
<tr>
<td>BLH</td>
<td>52</td>
<td>3.9</td>
<td>1</td>
<td>3.8</td>
</tr>
<tr>
<td>JHH</td>
<td>204</td>
<td>4.5</td>
<td>8</td>
<td>3.9</td>
</tr>
<tr>
<td>All study hospitals</td>
<td>609</td>
<td>4.3</td>
<td>27</td>
<td>3.8</td>
</tr>
</tbody>
</table>

Source: HIE inpatient statistics, 2008/09 and IPART analysis.

RPAH and JHH have the longest length of stay, as shown in Table 4.1. However, a significant part of this is due to a few patients with a long length of stay, for example 14 of the 27 patients with a length of stay or more than 7 days are at RPAH and 8 are at JHH. Excluding these patients significantly reduces the difference in the length of stay between the study hospitals.

There are significant differences in the average length of stay for different conditions. For example, the average length of stay ranged between 6 days for ‘benign neoplasm of ovary’ to 1 day for ‘abnormal findings in specimens from female genital organs, abnormal cytological findings’. This suggests that there is probably complexity that is not adequately captured in the DRG system.

Figure 4.1  Proportion of hysterectomy stays by length of stay (days)

Data source: HIE inpatient statistics, 2008/09 and IPART analysis.
RNSH does 10% of cases on a 23 hour basis, and over 33% of cases have a length of stay of less than 2 days, as shown in Figure 4.1. The other hospitals have much lower 23 hour surgery rates.

The shorter average length of stay at GH is due to a significantly smaller share of stays of more than 4 days than at the other hospitals.

**4.2 Comparing length of stay by surgical procedure**

Table 4.2 compares the average length of stay for hysterectomy patients by surgical procedure.

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Abdominal days</th>
<th>Vaginal days</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPAH</td>
<td>4.4</td>
<td>4.5</td>
</tr>
<tr>
<td>GH</td>
<td>4.1</td>
<td>3.1</td>
</tr>
<tr>
<td>RNSH</td>
<td>5.0</td>
<td>2.7</td>
</tr>
<tr>
<td>BLH</td>
<td>4.1</td>
<td>3.8</td>
</tr>
<tr>
<td>JHH</td>
<td>4.7</td>
<td>3.4</td>
</tr>
</tbody>
</table>

*Note:* The figures in this table exclude case outliers with a length of stay of 12 days or more. Laparoscopic or laparoscopically-assisted vaginal hysterectomies are not included.

*Source:* HIE inpatient statistics, 2008/09 and IPART analysis.

The average length of stay varies depending on the surgical procedure adopted. The average length of stay at the study hospitals varied from 4.1 days to 5.0 days for abdominal hysterectomies and from 2.7 days to 4.5 days for vaginal hysterectomies (excluding case outliers with a length of stay of 12 days or more). This is a further complication in the casemix that the DRG system does not pick up.

Further analysis showed that the longer length of stay for vaginal hysterectomies at RPAH is mainly due to the small number of patients that are admitted for only 1 or 2 days for this procedure (see Figure 4.2).
4.3 Variation between physicians in episode length of stay

There is a great deal of variation between treating physicians in the proportion of patients whose stay is either 1 or 2 days. Figure 4.3 shows this by presenting treating doctors and the number of patients they treated compared with the proportion of those patients whose length of stay was less than 1 or 2 day. We can see that for 2 physicians, all of their patients spend less than 2 days in hospital, and for 1 physician, half of their patients spend less than 1 day in hospital. However, a greater majority of physicians treat patients who spend at least 2 days in hospital.

Data source: HIE inpatient statistics, 2008/09 and IPART analysis.
There is also significant variation between treating physicians in the average length of stay, as show in Figure 4.4. In this figure each physician is again identified by the number of hysterectomies performed in 2008/09. The horizontal axis shows the number of hysterectomies per physician, and the vertical axis shows the average length of stay. Each physician is represented by a blue diamond.

For example, a physician who performed 35 hysterectomies kept his/her patients in hospital for 3.3 days on average. There were 2 physicians who performed 22 surgeries each. One of these kept his/her patients in hospital for an average of 4.5 days, while the other kept his/her patients in hospital for an average of 3.7 days.
Figure 4.4  Average length of stay by number of hysterectomies per treating doctor

Note: An outlier of 18 days is excluded.

Data source: HIE inpatient statistics, 2008/09 and IPART analysis.
5 Costs of providing inpatient care

To compare the costs of caring for hysterectomy patients at the study hospitals, we examined the major clinical resources used to provide inpatient care during their ‘acute episode’ (ie, using LOS1). The clinical resources we examined were:

- nursing staff in wards
- imaging
- pathology
- blood use
- operating theatres.

The sections below discuss our analysis of the estimated costs for each of these resources across the study hospitals. For some resources, they also compare our estimated costs with estimates based on provisional or final data reported to NSW Health by area health services as part of the NHCDC.17

Note that given the scope of our task for this study, we were not able to undertake a full bottom-up costing of all the above resource categories. Instead, we used a range of approaches, based on the most reliable and consistent data we could obtain in the time available. The methodologies we used are outlined in the sections below, and discussed in more detail in our report, NSW Health costs and outcomes study by IPART for selected NSW hospitals. Also note that while senior and junior medical staffing is a major cost for hysterectomies, we were not able to compare the use and management of these clinical resources due to the lack of consistent data.

5.1 Cost of nursing staff in wards

Nursing is one of the largest expenditure areas in hospital budgets, and is a significant part of the cost of the acute care of patients having hysterectomies.

---

17 Due to time constraints we used final NHCDC data only where these were substantially different from the provisional data. For this case study we used final NHCDC data only for pathology costs.
5.1.1 Methodology

To analyse this cost and allow comparisons with the NHCDC, we focused on:

- the cost of nursing staff in wards (ie, excluding those of nursing staff in operating theatres or senior nursing categories that provide area-wide or hospital-wide functions)
- nursing costs for the acute episode only (ie, LOS1).

Our methodology for estimating nursing costs and its limitations are briefly described in Box 5.1 and in more detail in Chapter 8 of the main report, *NSW Health costs and outcomes study by IPART for selected NSW hospitals*.

We excluded RPAH from our analysis because the gynaecology ward at this hospital moved during the year, making the costs unreliable.
Box 5.1 How we estimated nursing costs

IPART used a model for each hospital to allocate ward nursing costs to each DRG grouping and compare nursing costs.

We calculated ‘nursing hours per patient day’, ‘nursing cost per patient hour’ and ‘nursing cost per acute episode’ for 2008/09 by:

- Mapping the wards in each hospital to cost centres – so we could use these to extract relevant payroll information for each ward.
- Extracting information from the payroll on nursing classification, nursing pay and nursing hours worked for each ward.
- Applying inpatient fractions to our total ward nursing cost – so we only included nursing costs for acute patient care. Note that some hospitals have a fraction of ‘1’ where other hospitals may have fractions like ‘0.95’ for similar wards.
- Allocating ward nursing costs to all patients on the ward, based on their time on the ward and the nursing service weights for their DRG.
- Allocating a cost of nursing care to each patient - for each step of the patient’s stay in acute care. Note that from patient level episode information we attributed a cost to each ward transfer during their ‘acute’ episode.

We then applied our estimate of nursing cost per hour to the average length of the acute episode to obtain an estimate of the ‘nursing cost per episode’. We also calculated costs with IFRAC = 1 for comparison.

Qualifications

- For our calculations, we included only direct costs of ordinary hours (excluding leave), penalty rates and overtime, obtained from payroll data.
- The number of ‘nursing hours per patient day’ depends on the occupancy rates of the wards. A higher occupancy rate reduces the hours per patient day but such a change can cause other issues, like outliers or access block.
- The ‘nursing hours per patient day’ is the share of a patient’s use of the nursing staff based on the nursing service weights. These service weights are not perfect and the mix of other patients on the ward may impact on the nursing hours attributed to a patient and hence their cost. The service weights do not take into account the generally higher cost of patients at the start of their hospital stay.
- Some wards have a mix of more acute care with rehabilitation. Fewer nursing hours and lower costs are attributed to the ‘acute’ episode in such wards compared with wards in hospitals that have a greater separation of roles (acute wards separate from rehabilitation).
- Our nursing methodology excludes ‘wards’ like emergency departments where it is particularly difficult to determine the inpatient fraction, but allocated a nursing cost for the time spent in emergency.
- Hospitals with a shorter reported length of stay for the ‘acute’ episode may be expected to have a higher number of nursing hours per day and higher daily nursing costs.
5 Costs of providing inpatient care

5.1.2 Use of IFRACs

The hospitals use inpatient fractions (IFRACs) to allocate staff time to acute care and other staff responsibilities. We calculated two sets of inpatient nursing costs, the first using the hospitals’ IFRACs and the second setting all IFRACs to 1.\(^\text{18}\) We did this because we were concerned that IFRACs may not be consistently applied by the hospitals.\(^\text{19}\)

JHH has an IFRAC of 1, BLH and GH have IFRACs of 0.98 and 0.94 respectively, while RNSH has an IFRAC of 0.79. These IFRACs may be valid, because ward nursing staff (except at JHH) may spend time on non-inpatient activities (e.g., staffing outpatient clinics). However, the purpose of our analysis is to show how sensitive the nursing cost estimates are to IFRACs. IFRACs also underlie the NHCDC estimates of ward costs.

5.1.3 Ward nursing costs for all hysterectomies

Table 5.1 contains comparisons of our estimates of the average ward nursing costs for the study hospitals (excluding RPAH). The last column shows the direct nursing costs from the provisional data for the NHCDC, which we compare with our estimates of cost.

Our analysis indicates that the cost per episode is affected by three main factors:

- IFRACs
- nursing hours per patient day (i.e., nursing staff-to-patient ratio)
- nursing staff mix.

We found that these factors outweigh the impact of the length of stay on the average cost per acute episode for the DRG as a whole, partly because the length of stay is fairly uniform across the hospitals (except JHH). However, as discussed in section 5.1.4 below, we found that the length of stay accounts for most of the cost difference between different surgical procedures within each hospital.

IFRACs affect both the nursing costs per acute episode and the nursing costs per patient day (see Table 5.1 and Table 5.2). When all nursing costs are attributed to inpatient care (i.e., IFRACs=1), there is a smaller variation in nursing costs across the study hospitals. Setting IFRACs to 1 has the biggest impact on RNSH, because the IFRACs used at this hospital are comparatively low. When IFRACs are used, RNSH has the lowest cost per episode ($807), but when IFRACs are set to 1, RNSH has the highest cost per episode along with BLH (respectively $1,019 and $1,018).

\(^{18}\) Setting IFRACs to 1 means that we allocated 100% of the nursing time to inpatient care at the hospitals for the purpose of comparison.

\(^{19}\) IFRACs may differ between the hospitals for valid reasons, because the ward nursing staff in some hospitals may spend more time on outpatient activities than those in other hospitals. The purpose of our analysis is to show how sensitive the nursing cost estimates are to IFRACs.
We found that the second factor, the number of nursing hours per patient day (which reflects the nursing staff-to-patient ratio), outweighed the impact of length of stay on the hospitals’ episode costs. For example, we estimated that the average cost of nursing per acute episode is lower at JHH ($893) than at BLH ($1,002) when IFRACs are used, even though JHH has a longer length of stay (4.5 days) than BLH (3.9 days). The reason for this is that JHH has only 5.2 nursing hours per patient day compared with 7.5 at BLH, which translates into a significantly lower cost per patient day at JHH ($201) compared with BLH ($256). (See Table 5.2.)

The third factor is the nursing staff mix, which affects the average cost per nursing hour as well as the number of hours per patient day (and hence the average cost per patient day). A more senior staff means a higher cost per nursing hour, but fewer hours per patient day. The net effect of this on the cost per patient day depends on the extent to which the higher hourly cost of a more senior staff is offset by a lower number of nursing hours.

Our analysis indicates that JHH has a far higher percentage of Registered Nurses (RNs) and Clinical Nurse Specialists (CNSs) than any of the other hospitals (91% combined), and therefore a higher average cost per nursing hour of $39 (Table 5.3). But it still has the lowest cost per patient day ($201) because it has such a low number of nursing hours per patient day (5.2 hours). Note however that the low number of hours per patient at JHH may also be a consequence of other factors such a high bed occupancy rate or staff shortages.

Conversely, BLH has the lowest percentage of RNs and CNSs (65%), and the lowest costs per nursing hour ($34). But the high number of nursing hours per patient day at BLH results in a significantly higher cost per patient day ($256).

The direct nursing costs from the provisional data for the NHCDC (Table 5.1, last column and Figure 5.1) vary over a far wider range than our nursing cost estimates – from $320 at JHH to $1,579 at GH. The costs for JHH are particularly low compared with our cost estimates, while the costs for GH are significantly higher.

Table 5.1 Ward nursing costs per acute episode, with and without IFRACs

<table>
<thead>
<tr>
<th>Hospital</th>
<th>LOS1 days</th>
<th>Episode nursing cost with IFRAC</th>
<th>IFRAC no.</th>
<th>Episode nursing cost, IFRAC =1</th>
<th>NHCDC direct ward costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPAH</td>
<td>4.6</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>410</td>
</tr>
<tr>
<td>GH</td>
<td>3.6</td>
<td>925</td>
<td>0.94</td>
<td>987</td>
<td>1,579</td>
</tr>
<tr>
<td>RNSH</td>
<td>3.7</td>
<td>807</td>
<td>0.79</td>
<td>1,019</td>
<td>1,066</td>
</tr>
<tr>
<td>BLH</td>
<td>3.9</td>
<td>1,002</td>
<td>0.98</td>
<td>1,018</td>
<td>1,266</td>
</tr>
<tr>
<td>JHH</td>
<td>4.5</td>
<td>893</td>
<td>1.00</td>
<td>895</td>
<td>320</td>
</tr>
</tbody>
</table>

**Note:** Episode nursing cost calculated using acute episode LOS measure (LOS1).

**Source:** IPART analysis from HIE inpatient statistics, 2008/09, payroll data and provisional cost data 2008/09, NHCDC.
### Table 5.2  Nursing costs and hours per patient day, with and without IFRACs

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Nursing costs per patient day</th>
<th>Nursing hours per patient day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With IFRAC</td>
<td>IFRAC=1</td>
</tr>
<tr>
<td></td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>RPAH</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>GH</td>
<td>254</td>
<td>271</td>
</tr>
<tr>
<td>RNSH</td>
<td>217</td>
<td>273</td>
</tr>
<tr>
<td>BLH</td>
<td>256</td>
<td>260</td>
</tr>
<tr>
<td>JHH</td>
<td>201</td>
<td>201</td>
</tr>
</tbody>
</table>

**Source:** HIE inpatient statistics, 2008/09, payroll data and IPART analysis.

### Table 5.3  Nursing costs by award category, with IFRACs

<table>
<thead>
<tr>
<th>Nursing hours by award category (%)</th>
<th>All</th>
<th>CNS</th>
<th>RN</th>
<th>EN</th>
<th>AIN</th>
<th>Students/trainees</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPAH</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>GH</td>
<td>100</td>
<td>6</td>
<td>64</td>
<td>28</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>RNSH</td>
<td>100</td>
<td>4</td>
<td>73</td>
<td>14</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>BLH</td>
<td>100</td>
<td>0</td>
<td>65</td>
<td>26</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>JHH</td>
<td>100</td>
<td>19</td>
<td>72</td>
<td>8</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nursing cost per hour ($)</th>
<th>All</th>
<th>CNS</th>
<th>RN</th>
<th>EN</th>
<th>AIN</th>
<th>Students/trainees</th>
</tr>
</thead>
<tbody>
<tr>
<td>RPAH</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>GH</td>
<td>36</td>
<td>52</td>
<td>39</td>
<td>28</td>
<td>24</td>
<td>18</td>
</tr>
<tr>
<td>RNSH</td>
<td>35</td>
<td>45</td>
<td>37</td>
<td>30</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
<td>BLH</td>
<td>34</td>
<td>43</td>
<td>39</td>
<td>27</td>
<td>22</td>
<td>21</td>
</tr>
<tr>
<td>JHH</td>
<td>39</td>
<td>41</td>
<td>39</td>
<td>29</td>
<td>19</td>
<td>19</td>
</tr>
</tbody>
</table>

**Note:** There is no significant change to these figures with IFRAC=1. CNS = Clinical Nurse Specialist; RN = Registered Nurse; EN = Enrolled Nurse; AIN = Assistant in Nursing. See the Glossary at the end of the Appendices for descriptions of these nursing levels.

**Source:** HIE inpatient statistics, 2008/09, payroll data and IPART analysis.
5.1.4 Ward nursing costs for abdominal and vaginal hysterectomies

As previously discussed, this hysterectomy DRG covers a range of different conditions and procedures. To compare the costs on a more like-with-like basis, we calculated separate costs for abdominal and vaginal hysterectomies. To further improve comparability, we excluded cases with a length of stay of 12 days or more.²⁰

²⁰ Most of these long-stay cases are at JHH and RPAH, which have specialised gynaecology oncology units and have a higher proportion of complex cases in their casemix.
### Table 5.4 Ward nursing costs for abdominal and vaginal hysterectomies (excluding long stay), with and without IFRACs

<table>
<thead>
<tr>
<th>Hospital</th>
<th>LOS1 Episode nursing cost with IFRAC</th>
<th>Episode nursing cost, IFRAC = 1</th>
<th>NHCDC direct ward costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>days</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td><strong>Abdominal hysterectomies excluding long stay</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPAH</td>
<td>4.4</td>
<td>na</td>
<td>390</td>
</tr>
<tr>
<td>GH</td>
<td>4.1</td>
<td>1,065</td>
<td>1,133</td>
</tr>
<tr>
<td>RNSH</td>
<td>5.0</td>
<td>1,093</td>
<td>1,388</td>
</tr>
<tr>
<td>BLH</td>
<td>4.1</td>
<td>1,058</td>
<td>1,073</td>
</tr>
<tr>
<td>JHH</td>
<td>4.7</td>
<td>799</td>
<td>800</td>
</tr>
<tr>
<td><strong>Vaginal hysterectomies excluding long stay</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPAH</td>
<td>4.5</td>
<td>na</td>
<td>524</td>
</tr>
<tr>
<td>GH</td>
<td>3.1</td>
<td>800</td>
<td>843</td>
</tr>
<tr>
<td>RNSH</td>
<td>2.7</td>
<td>545</td>
<td>681</td>
</tr>
<tr>
<td>BLH</td>
<td>3.8</td>
<td>969</td>
<td>986</td>
</tr>
<tr>
<td>JHH</td>
<td>3.4</td>
<td>607</td>
<td>607</td>
</tr>
</tbody>
</table>

*Cases with a length of stay of 12 days or more excluded.*

**Note:** Episode nursing cost calculated using acute episode LOS measure (LOS1).

**Source:** IPART analysis from HIE inpatient statistics, 2008/09, payroll data and provisional cost data 2008/09, NHCDC.

### Table 5.5 Nursing costs and hours, with and without IFRACs

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Nursing costs per patient day</th>
<th>Nursing hours per patient day</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With IFRAC</td>
<td>IFRAC = 1</td>
</tr>
<tr>
<td></td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td><strong>Abdominal hysterectomies excluding long stay</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPAH</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>GH</td>
<td>258</td>
<td>275</td>
</tr>
<tr>
<td>RNSH</td>
<td>218</td>
<td>277</td>
</tr>
<tr>
<td>BLH</td>
<td>257</td>
<td>261</td>
</tr>
<tr>
<td>JHH</td>
<td>171</td>
<td>171</td>
</tr>
<tr>
<td><strong>Vaginal hysterectomies excluding long stay</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPAH</td>
<td>na</td>
<td>na</td>
</tr>
<tr>
<td>GH</td>
<td>255</td>
<td>269</td>
</tr>
<tr>
<td>RNSH</td>
<td>202</td>
<td>252</td>
</tr>
<tr>
<td>BLH</td>
<td>254</td>
<td>258</td>
</tr>
<tr>
<td>JHH</td>
<td>179</td>
<td>179</td>
</tr>
</tbody>
</table>

*Cases with a length of stay of 12 days or more excluded.*

**Source:** HIE inpatient statistics, 2008/09, payroll data and IPART analysis.
At all the hospitals, the episode cost for abdominal hysterectomy is higher than for vaginal hysterectomy (Table 5.4). The main reason for this difference is the longer length of stay for abdominal hysterectomies. Abdominal hysterectomies also require slightly more nursing hours per patient day at all the hospitals except BLH and JHH (Table 5.5).

The NHCDC costs similarly show higher costs for abdominal hysterectomies than vaginal hysterectomies, although the range is far wider than our analysis indicates.

### 5.2 Imaging costs

Table 5.6 sets out our calculations for the average cost of all imaging tests for hysterectomy patients, during their acute episode and on the day of their admission. It also sets out the average costs for selected high-cost tests (CT/MRIs, ultrasound and fluoroscopy), as well as the direct and indirect imaging costs from the provisional data for the NHCDC. Our methodology for calculating these costs is explained in Box 5.2.

We found that the average cost of tests for hysterectomy patients is relatively low, and varies from $47 at RPAH to $20 at RNSH. At RNSH most of the testing is done on the day of admission, but this is not the case for the other hospitals. We also found a higher degree of consistency in the hospitals’ use of imaging than is reflected in the NHCDC (Table 5.6).

<table>
<thead>
<tr>
<th></th>
<th>All imaging tests</th>
<th>CT/MRI</th>
<th>Ultrasound</th>
<th>Fluoroscopy</th>
<th>NHCDC direct and indirect costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td><strong>Acute episode</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPAH</td>
<td>47</td>
<td>21</td>
<td>2</td>
<td>3</td>
<td>193</td>
</tr>
<tr>
<td>GH</td>
<td>29</td>
<td>19</td>
<td>7</td>
<td>-</td>
<td>37</td>
</tr>
<tr>
<td>RNSH</td>
<td>20</td>
<td>9</td>
<td>2</td>
<td>-</td>
<td>13</td>
</tr>
<tr>
<td>BLH</td>
<td>35</td>
<td>31</td>
<td>-</td>
<td>-</td>
<td>241</td>
</tr>
<tr>
<td>JHH</td>
<td>44</td>
<td>20</td>
<td>4</td>
<td>1</td>
<td>91</td>
</tr>
<tr>
<td><strong>Day of admission</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPAH</td>
<td>6</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>na</td>
</tr>
<tr>
<td>GH</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>na</td>
</tr>
<tr>
<td>RNSH</td>
<td>16</td>
<td>9</td>
<td>2</td>
<td>0</td>
<td>na</td>
</tr>
<tr>
<td>BLH</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>na</td>
</tr>
<tr>
<td>JHH</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>na</td>
</tr>
</tbody>
</table>

*Source: IPART analysis using data from hospital imaging services and provisional cost data 2008/09, NHCDC.*
**Box 5.2  Our approach to estimating imaging costs**

We did not use a bottom-up costing approach to calculate imaging costs. Instead, we used detailed information from imaging services on the number and type of tests performed, the time and date. We use data for ‘acute’ episodes in 2008/09. As a proxy for cost, we attribute a value based on the Medicare Benefits Schedule (MBS). Each test is valued at 100% of the MBS fee.

More information is included in the main report, *NSW Health costs and outcomes study by IPART for selected NSW hospitals*, Chapter 11 on imaging.

**5.3  Pathology costs**

Table 5.7 shows the average pathology costs for hysterectomy patients. Our methodology is explained in Box 5.3.

**Table 5.7  Average pathology costs**

<table>
<thead>
<tr>
<th></th>
<th>Acute episode</th>
<th>Day of admission</th>
<th>NHCDC direct and indirect pathology costs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>RPAH</td>
<td>259</td>
<td>148</td>
<td>265</td>
</tr>
<tr>
<td>GH</td>
<td>87(^{a})</td>
<td>45(^{a})</td>
<td>103</td>
</tr>
<tr>
<td>RNSH</td>
<td>221</td>
<td>135</td>
<td>186</td>
</tr>
<tr>
<td>BLH</td>
<td>251</td>
<td>183</td>
<td>241</td>
</tr>
<tr>
<td>JHH</td>
<td>276</td>
<td>162</td>
<td>547</td>
</tr>
</tbody>
</table>

\(^{a}\) GH excludes many item numbers for high cost test.

*Source:* IPART analysis using data from hospital pathology services, 2008/09; and final cost data 2008/09, NHCDC.

We found that pathology costs are in the region of $250 per patient at all hospitals, except GH. We also found that all the hospitals do a significant proportion of pathology test on the day of admission. Pathology test for hysterectomy involve a combination of low cost tests and a higher charge for examination of the removed tissue.

Our analysis showed that the cost for pathology tests at GH was far lower than at the other hospitals ($87). However, it appears that GH imaging data excludes many item numbers for the higher costs tests. These tests are believed to be performed elsewhere and not captured in the GH imaging data system. An examples is the item number 72824:

Examination of complexity level 4 biopsy material with 1 or more tissue blocks, including specimen dissection, all tissue processing, staining, light microscopy and professional opinion or opinions - 2 to 4 separately identified specimens.
The MBS value of this item is currently $142. Adding this item to GHs costs would increase its cost to $229, which is similar the other hospitals’ costs.

We found a far higher degree of consistency in the hospitals’ use of pathology for diagnostic purposes than reflected in the NHCDC.

<table>
<thead>
<tr>
<th>Box 5.3 Our approach to estimating pathology costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>We did not use a bottom up costing for pathology. Instead, we attributed a value for pathology tests based on internal billing data between the hospitals and the pathology services. We also used information on the time and date of tests.</td>
</tr>
<tr>
<td>Charging arrangements at each hospital are similar, but are not identical. All pathology services base their charges on the Medicare Benefit Schedule.</td>
</tr>
<tr>
<td>More information is included in the main report, <em>NSW Health costs and outcomes study by IPART for selected NSW hospitals</em>, Chapter 12 on pathology costs.</td>
</tr>
</tbody>
</table>

### 5.4 Blood use costs

We obtained detailed blood use data for each hospital, and calculated blood costs by using an attributed cost of $250 per unit of blood. We found that the average cost of blood for hysterectomy patients was relatively low. Blood use was much higher for abdominal hysterectomies than for vaginal hysterectomies, and was particularly high for abdominal surgery at BLH (Table 5.8).

<table>
<thead>
<tr>
<th>Table 5.8 Average blood use costs for hysterectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hospital</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>RPAH</td>
</tr>
<tr>
<td>GH</td>
</tr>
<tr>
<td>RNSH</td>
</tr>
<tr>
<td>BLH</td>
</tr>
<tr>
<td>JHH</td>
</tr>
</tbody>
</table>

*Source: IPART analysis using data from hospital blood use data, 2008/09.*
5.5 Operating theatre time and costs

We compared operating theatre time for the various hysterectomy procedures at the study hospitals. We also compared operating theatre times with NHCDC operating theatre costs.

We found that in general, operating theatre time (time from when surgery commenced to when surgery was completed) was shorter for vaginal hysterectomies than for abdominal hysterectomies, except at RNSH (Table 5.9). The average time of surgery involving a laparoscope was longer than for either abdominal or vaginal surgery. A laparoscopic hysterectomy took on average 62 minutes longer than an open abdominal hysterectomy, while a laparoscopically-assisted vaginal hysterectomy took 36 minutes longer than an open abdominal hysterectomy.

We cannot directly compare our analysis of operating theatre times with the NHCDC operating theatre costs, because the NHCDC costs include items that are not related to time spent in surgery (such as goods and services and some anaesthetic department costs). However, we note that there is a significantly wider variation in the NHCDC costs than in operating theatre times. For example, Figure 5.2 shows that the NHCDC cost for:

- abdominal surgery at JHH is 2.7 times the cost at RNSH (which has the lowest cost), while the surgery time at JHH is about 1.5 times the surgery time at RNSH
- vaginal surgery at JHH is 1.9 times the cost at RNSH, even though average theatre time at JHH is about 8 minutes shorter than at RNSH.

---


22 We used the provisional NHCDC costs for abdominal and vaginal surgery, scaled down in proportion to the change in total operating theatre costs between the provisional and final NHCDC data.

23 Operating theatre times may not be fully comparable between hospitals because they use different systems to capture their theatre times.
Table 5.9 Operating theatre times and NHCDC costs for abdominal and vaginal hysterectomies

<table>
<thead>
<tr>
<th>Hospital</th>
<th>Theatre time</th>
<th>NHCDC costsa</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Minutes</td>
<td>$</td>
</tr>
<tr>
<td>Abdominal hysterectomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPAH</td>
<td>127.3</td>
<td>3,775</td>
</tr>
<tr>
<td>GH</td>
<td>93.7</td>
<td>3,377</td>
</tr>
<tr>
<td>RNSH</td>
<td>71.4</td>
<td>1,599</td>
</tr>
<tr>
<td>BLH</td>
<td>145.4</td>
<td>2,909</td>
</tr>
<tr>
<td>JHH</td>
<td>110.3</td>
<td>4,320</td>
</tr>
<tr>
<td>Vaginal hysterectomy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPAH</td>
<td>107.0</td>
<td>3,345</td>
</tr>
<tr>
<td>GH</td>
<td>86.0</td>
<td>3,158</td>
</tr>
<tr>
<td>RNSH</td>
<td>84.6</td>
<td>1,894</td>
</tr>
<tr>
<td>BLH</td>
<td>111.8</td>
<td>2,909</td>
</tr>
<tr>
<td>JHH</td>
<td>77.0</td>
<td>3,519</td>
</tr>
</tbody>
</table>

a These are the provisional NHCDC costs for abdominal and vaginal surgery scaled down in proportion to the change in total operating theatre costs between the provisional and final NHCDC data.

Note: Operating theatre times may not be fully comparable between hospitals because they use different systems to capture their theatre times.

Source: IPART analysis using data from hospital operating theatres and NHCDC costs, 2008/09.

Figure 5.2 Ratio of time in surgery and NHCDC costs to RNSH time and costs for abdominal and vaginal surgery (RNSH = 1)

Source: IPART analysis using data from hospital operating theatres and provisional NHCDC costs, 2008/09.
Overall, we believe that the NHCDC costs for 2008/09 could be misleading. They could be improved by using standard clinical feeds (i.e., actual patient data from clinical systems) in the costing process, similar to the process we have used for our analysis. The standard clinical data used in costing could also be used to provide useful data for clinicians and others to compare resource use and performance.

We also believe that the Department needs to establish more ‘rules’ to ensure consistent data for the NHCDC, and needs to audit the IFRACs and cost centres regularly.
6 Configuration of care

The term ‘configurations of care’ refers to the way that hospitals choose to manage and provide patient care, including their clinical practices. The particular configurations of care within a hospital can be influenced by a complex array of factors, including national or state-wide guidelines or protocols, the culture, practices and controls of the individual hospital, the culture and practices of each clinical unit and its leadership and the preferences of each clinician. Differences in the way hospitals manage and provide patient care can also lead to differences in the costs and outcomes of that care.

Due to time constraints we did not have detailed discussions about configurations of care for hysterectomies during our hospital visits, and we can therefore make only three very general observations.

The first observation relates to the regional role of RPAH, RNSH and JHH which, along with 4 other NSW public hospitals, have specialist gynaecology oncology units. These centres for gynaecological oncology were established by NSW Health to improve clinical outcomes by concentrating treatment at a few hospitals. These hospitals may have a more complex casemix, because some patients admitted through these units may be coded into this DRG N04Z “hysterectomy for non-malignancy”. For example, we found a number of cases with diagnoses like ‘carcinoma in situ of cervix, unspecified’ who were included in this DRG.

The second observation is that there are differences in the proportion of hysterectomy cases performed on a 23 hour basis across the study hospitals. RNSH performs hysterectomies on around 10% of patients in DRG N04Z “hysterectomy for non-malignancy” on a 23 hour basis. The other hospitals had far lower 23 hour surgery rates. See section 4.1.

---

The third observation concerns the use of alternative procedures to hysterectomy. The Clinical Excellence Commission has raised concerns that hysterectomies may be overused in some areas. They point to studies that show there are variations in rates between regions that cannot be explained by underlying patterns of disease. They found that hysterectomy rates in NSW for women under 35 years old are closely correlated with socio-economic status. They also found that hysterectomy rates for all age groups are significantly higher for area health services with large rural populations.\(^{25}\)

As previously mentioned, hysterectomy is an area of declining activity because hysterectomies are increasingly being replaced by more conservative procedures such as endometrial ablation and uterine artery embolisation. NSW Health could investigate the extent to which these other procedures are being used instead of hysterectomies in different hospitals and areas.

**Recommendation**

1. That any future studies of hysterectomy compare the costs and outcomes for hysterectomies with the costs and outcomes of other procedures such as endometrial ablation and uterine artery embolisation.

\(^{25}\) Clinical Excellence Commission, *Quality and Safety of Health Care in NSW, version 10 (confidential draft of Tuesday 5 July 2009)*, pp 130-133.
7 Outcome, safety and quality indicators

The terms of reference for this study required us to analyse available data on differences in clinical outcomes across the 5 study hospitals. However, while there are a number of safety and quality indicators being collected locally, at the state level and through clinical registries, there are few clinically agreed outcome indicators. As such, we found that data on only a few indicators of clinical outcomes are collected consistently across hospitals, or on a state-wide (or national) basis. Therefore, we worked with clinical experts to establish a set of outcome, safety and quality indicators that are clinically relevant, and for which we could feasibly obtain data in the timeframe for our study.

The sections below set out the clinical indicators we selected for hysterectomy.

7.1 How we developed a set of clinical indicators

To identify the indicators we should focus on for this study, we worked with a number of eminent clinicians on our Clinical Reference Group\(^\text{26}\) to develop a set of outcome indicators. We also consulted clinicians in study hospitals and sought further advice from clinicians with specific expertise in the fields of interest, as well as other relevant organisations.

Essentially, we aimed to establish a list of indicators that were:

- widely accepted as being clinically appropriate
- likely to be available from NSW hospitals, the NSW Department of Health or other bodies, such as registries, and
- feasible for IPART to collect or calculate.

Following this clinical consultation, we established the set of indicators discussed in section 7.3 below. Some of these indicators are not true outcome indicators, but are safety and quality or process indicators. We were not able to obtain data for all of these indicators.

\(^{26}\) In the early stages of the review when indicators were being selected, our Clinical Reference Group comprised Professor Bruce Barraclough, Professor Clifford Hughes, Dr Michael Nicholl, Professor Ron Penny and Dr Hunter Watt. A number of other clinicians later joined the Clinical Reference Group and many other clinicians in study hospitals were consulted as part of this process.
7.2 Analysing indicators and risk-adjusting for patient characteristics

It’s important to recognise that hospitals’ performance against many outcome indicators is not simple to interpret and, when considered in isolation, can be misleading. Therefore, this performance needs to be analysed within the appropriate context.

In addition, hospitals treat patients with different mixes of illnesses, which can influence the likelihood of adverse outcomes at the hospitals. To make meaningful and fair comparisons of the performance of the study hospitals on some outcome indicators, the analyses were risk-adjusted for factors outside the control of the hospitals (ie, differences in patient characteristics – see Box 7.1).

Appendix B provides further details for the risk-adjusted indicator provided by NSW Health, including the data sources used, the relevant time period for the data and the adjustment factors applied.

---

**Box 7.1 How data on indicators was risk-adjusted for differences in patient characteristics**

To meaningfully compare the performance of the study hospitals on some outcome indicators, the hospitals’ data on these indicators needed to be risk-adjusted to account for differences in patient characteristics that can influence the likelihood of adverse outcomes. In particular, NSW Health adjusted data on mortality rates for the following patient characteristics:

- age
- sex
- comorbidity, and
- socio-economic status.

To adjust for comorbidity, NSW Health used the Charlson index. This index simplifies the wide range of comorbidities that may affect patients. It groups clinical conditions together (using ICD 10), and assigns numerical weights (eg, 1, 2, 3) to them, based on the risk of dying associated with the condition. Adding together the numerical weights for a patient’s comorbidities determines the patient’s combined Charlson index score, and therefore the severity of their comorbidities.

To make these adjustments, NSW Health used logistic regression in SAS 9.2. Where there were sufficient numbers, it took repeated measures for the same person into account using multilevel modelling. Where the number of events was too low to allow the above adjustment to be carried out in full, the degree of adjustment was reduced and this was noted for each indicator.

---

a The ABS Index of Relative Socio-Economic Disadvantage (IRSD) was used to estimate socio-economic status. The IRSD was assigned at Local Government Area level and grouped into quintiles from least disadvantaged to most disadvantaged for analysis.

7.3 List of clinical indicators for hysterectomy and their availability

Table 7.1 lists the 2 indicators we selected for hysterectomy. These indicators relate to the outcomes of care.

Table 7.1 Clinical indicators for hysterectomy and data availability

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Available?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30-day post-procedural infection rate</td>
<td>No – data not available from NSW Health</td>
</tr>
<tr>
<td>2</td>
<td>30-day mortality rate (risk adjusted)</td>
<td>Yes – data provided by NSW Health (see Appendix B)</td>
</tr>
</tbody>
</table>

7.3.1 30-day mortality rate

NSW Health calculated and provided 30-day mortality rates to compare hospital outcomes for hysterectomy patients. Box 7.2 explains the method used by NSW Health to calculate mortality and survival rates.

However, the analysis found that there were fewer than 5 deaths following hysterectomies in the 5 hospitals over the 3-year period 2005/06 to 2007/08. The number of deaths was too small to allow comparisons between the hospitals.
Box 7.2 Calculating mortality rates

The NSW Department of Health’s Centre for Epidemiology and Research calculated risk-adjusted odds ratios for mortality for patients treated in each study hospital in the hysterectomy case study area, using the methodology outlined below. We note that the NSW Department of Health does not usually undertake this type of analysis.

Data sources

The analysis for mortality and survival, apart from in-hospital mortality, was carried out using linked records of the NSW Admitted Patient Data Collection (APDC) and NSW Registry of Births, Deaths and Marriages death registration data. The analysis for in-hospital mortality was carried out using linked records of the APDC. In-hospital deaths and deaths from all causes were included for all relevant indicators.

Case-based analysis

As one person may have more than one admission for a specified condition, the analyses were ‘case-based’, where a case represents a hospital admission for a specified condition. This means that, for example, if a person died after 2 hospital admissions for a specified condition and the death occurred within the period specified by the indicator, then the case and therefore the death would be counted twice.

Adjusting for risk and comparing hospitals

Indicators were adjusted for patient age, sex, comorbidity and socio-economic status as described in Box 7.1.

Hospitals that were not significantly different in the adjustment model (at p<0.05) were grouped.
7 Outcome, safety and quality indicators
Appendices
Outcome, safety and quality indicators

Case study 10 - Hysterectomy
A List of full recommendations from main report

Consistency of DRG groupings

Our recommendations in this area are mainly aimed at making users of hospital data aware of some of the limitations of using DRG groupings for hospital comparisons in certain clinical areas.

1. That users of hospital cost and outcome data note that DRGs may contain a range of patient types with varying clinical resource requirements, costs of care and expected clinical outcomes. Therefore DRGs may not always provide the optimal basis for comparing costs and outcomes among hospitals.

2. In light of Recommendation 1, that the NSW Department of Health, and other health research bodies at both the state and national level, consider whether DRGs are a suitable basis for determining funding and comparing performance among hospitals (for various different types of hospital activity). Where they are not suitable, continue research to develop better approaches for these areas.

Consistency of patient numbers

Our recommendations on patient numbers are aimed at making users of hospital data aware of differences in patient counting practices and patient datasets between hospitals that can affect hospital comparisons, to improve consistency of patient counting practices between hospitals and lead to better integration of patient datasets.

3. That users of hospital data note that there are differences in practices relating to counting of patients that can affect hospital patient numbers and average cost comparisons eg, counting differences relating to admission status, billing status, location of care and collaborative care arrangements.

4. In light of Recommendation 3, that NSW Health clarifies and standardises administrative procedures including guidelines for recording of non-inpatients of various types, as well as ‘collaborative care’ patients.

5. That NSW Health considers ways of better integrating patient information held locally by hospital clinical units (such as eye clinics and cardiac catheter labs) with the HIE data set.
**Consistency of lengths of stay**

Our recommendations aim to improve consistency between hospitals on length of stay measures, and to make users of hospital data aware of the limitations of measures based on ‘acute episodes’.

6. That NSW Health monitors hospital practices relating to the classification of episodes into care types and type-changing practices (e.g., timing of type changes from acute to rehabilitation care) and provide clear and consistent guidelines to hospitals, so episode measures are more consistent among hospitals.

7. That users of hospital data note that ‘acute episodes’ often only represent a part of a patient’s hospital stay. Therefore, comparisons among hospitals using acute length of stay measures or acute costs may produce misleading results. This is particularly important for conditions that involve both acute and sub-acute care and/or transfers between facilities.

**Coding**

We have made recommendations aimed at improving the quality of medical records documentation and clinical coding in hospitals to both improve the quality of data for clinical research as well as to more accurately reflect casemix complexity.

8. That NSW Health should continue to improve the quality of medical record documentation and the accuracy and consistency of coding.

9. That hospitals should encourage consistent education on coding and facilitate communication between clinical staff and coders regarding both the coding process and the documentation required to code common clinical conditions, diagnoses or complications, such as AMI, angina and chest pain.

10. Where pathology test information can be readily extracted (e.g., Cerner sites), that systems be developed so this information can be used to validate coding and support work on variation in clinical practice and measuring clinical quality.

11. That NSW Health considers undertaking further analysis to identify pathology or imaging tests that can be used to help target audits of coding and support work on variation in clinical practice and measuring clinical quality – such as identifying types of pathology tests that correspond closely with diagnosis coding.
Clinical costing

Our recommendations are aimed at improving the quality and consistency of clinical costing data, and helping to ensure that quality costing data and clinical inputs to the costing process (such as data from prosthesis, pathology and imaging systems) can be used to inform hospital management about resource use, and clinicians about clinical practice.

12. That the NSW Department of Health works with the area health services and hospitals to apply a consistent set of rules for clinical costing covering cost centres and IFRACs so that data are consistent and comparable between the hospitals.

13. That NSW Health regularly audits the accuracy of cost centres and IFRACs used for clinical costing.

14. That NSW Health uses standard clinical data feeds (actual patient data) for clinical costing where this is feasible and useful.

15. That the data used for clinical costing purposes be available to hospitals and clinicians so they can undertake comparative analysis on clinical practices and performance.

Medical staff costs

Given our finding that there was a lack of consistency in the treatment of medical staff costs and the difficulty this created in estimating medical staff costs for our case study areas, we recommend:

16. That further work be undertaken to strengthen the quality and consistency of available information on medical staff costs.

Prosthesis costs

Our recommendations on prosthesis costs are aimed at improving prosthesis purchasing and making cost savings in this area. These should be considered in conjunction with our recommendation that clinical experts should review the appropriateness of clinical variation in prosthesis use and address this variation (see Recommendation 31).

17. That NSW Health notes the variation in prostheses use among the study hospitals including:
   - drug-eluting stents versus bare metal stents
   - single chamber pacemakers versus dual chamber pacemakers
   - different types of components for hip replacement procedures.

18. That NSW Health notes the range of approaches to prosthesis controls and the variation in prices currently paid for prostheses, including for exactly the same models.
19. That NSW Health facilitates sharing of information on purchase prices for prostheses to assist price negotiations with suppliers.

20. That NSW Health optimises prosthesis cost savings through tenders, supplier price agreements and controlled approaches to prosthesis purchasing, noting that clinical consultation and cooperation is essential as is retaining some flexibility to allow for special orders when clinically indicated.

**Imaging and pathology costs**

Our recommendations are aimed at encouraging better use of imaging and pathology data, and consideration of whether there should be standard treatment of imaging and pathology within clinical costing and whether internal charges should reflect actual costs. These recommendations should be considered in conjunction with our clinical case studies, which include comparisons of imaging use, and Recommendation 31, relating to clinical variation in imaging use for diagnosing appendicitis.

21/25 That NSW Health notes that imaging and pathology data can be used to monitor changes in imaging use and inform clinical practice, and that:

- All hospitals obtain detailed reports from pathology and imaging services on their test ordering patterns, including the number of tests by major test type and the cost of these tests.

- Hospitals routinely provide data to heads of clinical units to help inform them on resource use and provision of care to improve patient outcomes and discuss trends at management meetings – for example, summary reports that include both the number of tests by test type, and the value (or preferably cost) of these tests.

- NSW Health develops reports comparing the use of imaging and pathology tests for clinical groupings and circulates these to area health services and hospitals.

22. That NSW Health considers whether, for clinical costing purposes, it is appropriate for hospitals and area health services to base the value of imaging tests on the MBS rate for these tests and, if so, what standard percentage of this rate is appropriate for use by all hospitals given the actual costs of providing the test.

23. That NSW Health seeks to obtain detailed information from the pathology services on the number and type of tests and the actual cost of undertaking a range of typical tests for future comparisons of pathology costs.

24. That NSW Health addresses issues that prevent the actual costs associated with specific pathology tests and ordering patterns being disclosed by pathology services.

26. That NSW Health considers whether the detailed cost estimates that pathology services prepare as part of the benchmarking pathology project could be used for more accurate pricing between pathology services and hospitals, to enable clinicians to consider the actual cost of their clinical decisions.
Operating theatre costs

Our recommendations in relation to operating theatres aim to facilitate improvements in theatre management arrangements, and the quality and consistency of theatre data.

27. That NSW Health notes the differences in approaches to theatre management among hospitals and consider if there is scope to share information about how the better theatre arrangements are organised.

28. That NSW Health notes the issues regarding theatre data and work with the hospitals to improve the completeness of datasheets and apply a consistent set of rules for recording operating theatre times.

29. That NSW Health considers routine auditing of the quality of data on returns to theatre and considers the best way for achieving accuracy and consistency in this indicator.

Pharmacy costs

As we were not able to undertake a detailed comparison of pharmacy services and costs, our recommendations focus on encouraging further analysis in this area.

30. That NSW Health:
   - Notes the wide variation in the proportion of drugs dispensed versus held on imprest across the study hospitals.
   - Monitors the value of expired pharmacy stock and compares this among hospitals.
   - Considers standardised guidelines for the return of unused medication, principally to ensure patient safety but also to minimise wastage and reduce costs.
   - Considers whether antimicrobial stewardship programs should be implemented at the major hospitals where such programs are not currently in place. The purpose of these programs would be to help prevent antimicrobial resistance and reduce costs by preventing inappropriate use of antimicrobials.
**Configurations of care – Review of clinical variations during Stages 5 and 6 of the wider NSW Department of Health study**

Our case studies identified a number of differences in the way care is provided among study hospitals in specific clinical areas. We recommend that clinical experts consider these clinical differences or clinical issues as part of Stages 5 and 6 of the wider health study. This recommendation should be dealt with in conjunction with Recommendation 36, relating to variation in indicators of safety, quality and outcomes.

31. That NSW Health arranges for appropriate clinical expert groups to consider the following clinical issues identified in our case studies; and that where appropriate, NSW Health and the expert groups take steps to address clinical differences.

- **Hip joint replacement:**
  - Note that separation of planned and emergency cases may reduce lengths of stay for planned (arthritis) cases.
  - Address the variation in the selection of hip prosthesis components (including press fit, cementless hip stems versus cemented hip stems and ceramic femoral heads versus metal femoral heads) among study hospitals.

- **Major chest procedure:**
  - Note the different clinical pathways and high day of surgery admission rates for thoracic surgery patients at RPAH compared with other study hospitals.
  - Consider whether aspects of the model of care at RPAH are suitable to be used in other hospitals.

- **Breast surgery:**
  - Note the early discharge models at RNSH for breast surgery patients having mastectomies and
  - Consider whether such models should be followed more widely in NSW hospitals and the types of patient cases they should be used for (eg, simpler, unilateral cases or younger patients).

- **Cholecystectomy:**
  - Note the variation in the proportion of patients with cholelithiasis or cholecystitis who are operated on acutely as emergency admissions.
  - Consider whether this variation has significant quality of care implications.
  - Consider the relative costs and benefits of an emergency surgical services team model for ensuring early diagnosis and treatment of conditions like cholecystectomy and whether it should be more widely applied.
  - Note that costing of cholecystectomy should take into account the costs of prior related emergency department attendances. A similar approach should be adopted for other clinical conditions that are likely to involve multiple prior emergency department attendances.
Consider the relative costs and benefits of cholecystectomies with and without the use of fluoroscopy.

Appendicectomy

- Note the variation in the use of imaging tests for diagnosing appendicitis.
- Consider establishing standard protocols for diagnosing appendicitis, indicating when it is appropriate to use CT scans, MRIs and ultrasounds.
- As part of establishing standard protocols for diagnosing appendicitis, consider whether CT scans, MRIs and ultrasounds should only be used for certain patient groups (eg, older patients who are more likely to be suffering from other conditions with symptoms similar to appendicitis).
- Consider the relative costs and benefits of laparoscopic versus open surgery for appendicitis.

Stroke

- Consider ways to reduce the proportion of stroke patients coded with a principal diagnosis of 'stroke, not specified as haemorrhage or infarction' (ICD10 code I64).
- Consider developing consistent guidelines for the administration of tPA.
- Consider including tPA administration as a procedure in coding standards.
- Consider ways to improve transfers of suspected stroke patients to stroke units with minimum delay, including consultation with the Ambulance Service and Emergency Departments.
- Investigate whether it is useful and possible to combine Ambulance Service data on response time with hospital patient data to monitor time from call to ambulance to arrival at an appropriate hospital.
- Consider the costs and benefits of providing more rehabilitation care in the home.
- Pursue the collection of the data on outcome indicators from the National Stroke Research Institute.

Cardiology – Stents, Pacemakers and Defibrillators:

- Address the variation in the use of drug-eluting stents versus bare metal stents among study hospitals.
- Address the variation in the types of pacemakers used among study hospitals.
- Investigate whether there are differences in treatment procedures, or waiting times between presentation and procedure, for patients who present to hospitals without a 24 hour cardiac catheter laboratory, compared to patients who present to hospitals with a 24 hour cardiac catheter laboratory, and whether any differences in procedure or waiting times have implications for clinical outcomes.
- Consider ways of better integrating information held in cardiac catheter laboratories with the HIE data set.

  - Tracheostomy or ventilation greater than 95 hours:
    - Note that at BLH, clinicians tend to perform surgical tracheostomies, whereas at the other hospitals, these are usually performed percutaneously.

  - Cataract/lens procedure:
    - Assess the costs and benefits of toric lenses and develop guidelines for their use in public hospitals.

  - Hysterectomy:
    - That any future studies of hysterectomy compare the costs and outcomes for hysterectomies with the costs and outcomes of other procedures such as endometrial ablation and uterine artery embolisation.

### Improving outcome, safety and quality indicators

While current Commonwealth and State initiatives will improve outcomes data, we have made recommendations that will assist this process.

32. That NSW Health enhances understanding and use of mortality, survival, unplanned readmission and wound infection indicators and their risk adjustment by:
   - continuing to contribute to the development of ACSQHC’s safety and quality standards for these indicators
   - refining the methodology used for standardising or risk-adjusting these indicators
   - continuing to consult with clinicians regarding the agreed presentation of mortality, survival unplanned readmission and wound infection information
   - reporting this information on a more routine and regular basis consistent with ACSQHC data sets.

33. That NSW Health encourages hospitals to put in place systems to facilitate accurate coding of comorbidities and ensures that coding practices are consistent across hospitals.

34. That NSW Health works with ACSQHC to negotiate more streamlined arrangements for access to data held by third parties (such as clinical registries) for clinical analysis, and makes these data available to hospitals and clinicians.

35. That NSW Health explores the possibility of providing outcomes information to clinicians in a more systematic way as an aid to clinical improvement and a key indicator of performance.
Indicators of safety, quality or outcomes, - review of clinical variations during stages 5 and 6 of the wider NSW Department of Health project

We have also made a number of findings relating to variations in indicators of safety, quality or outcomes. Where we have observed apparent differences among hospitals, these should be considered by clinical expert groups in completing stages 5 and 6 of the Department of Health’s wider project. These differences should be considered in conjunction with differences in clinical practice (Recommendation 31).

36. That clinical expert groups consider the following clinical issues; and where appropriate, NSW Health and clinical expert groups take steps to address clinical variations as part of Stages 5 and 6 of the broader NSW Health review:

- Review the variations in outcome, safety and quality indicators among study hospitals, including their:
  - unplanned readmission rates
  - wound infection rates for selected surgical procedures.

- Review the variation in mortality and survival rates for all major chest surgery patients and consider whether to recommend changes to clinical practice or conduct further investigation involving:
  - a larger sample of hospitals, and
  - more detailed analyses for ‘like patients’ (ie, lung cancer, infection-related abscess/pyothorax and collapsed/punctured lung patients).

- Review the variation in the following clinical indicators for hip joint replacement surgery at the study hospitals:
  - wound infection rates
  - unplanned readmission rates.

- Review the variation in wound infection rates for appendicectomy and cholecystectomy surgery at the study hospitals.

- Note the variation in the following clinical indicators relating to obstetric delivery:
  - caesarean section rates for ‘selected primipara’
  - vaginal delivery rates following primary caesarean section
  - caesarean section rates after induction of labour for ‘selected primipara’
  - repeat caesarean section rates
  - significant tear rates

and monitor changes arising from the implementation of the NSW Health policy directive, Maternity – Towards Normal Birth in NSW, to determine whether this policy effectively addresses the variation.
Additional outcome indicators

We made recommendations to consider the costs and benefits of collecting data for the following areas where indicators are not commonly used.

37. That NSW Health considers the costs and benefits of collecting data and monitoring performance against the following indicators:
   - warfarin management
   - visual outcomes for patients undergoing lens procedures.

We also made a recommendation to develop a set of standard indicators for measuring care and/or outcomes in ICUs.

38. That NSW Health undertakes further work to develop a set of standard indicators for measuring care and/or outcomes in ICUs.

Time Out audits

Finally, we made a recommendation to improve consistency in the number of cases audited as part of the Time Out process relative to the number of separations.

39. That NSW Health specifies the number or proportion of patient cases that should be audited as part of the Time Out process.

Next steps - wider application of this study

40. That NSW Health refines and develops useful aspects of this study for application more widely to other hospitals, other health settings and other clinical conditions.
B  Risk-adjusted indicators provided by NSW Health

Table B.1 indicates the data sources and risk adjustment factors used for the risk-adjusted indicator provided by NSW Health.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Data Source</th>
<th>Numerator &amp; denominator</th>
<th>Risk-adjustment</th>
</tr>
</thead>
</table>
| 1   | 30-day mortality rate      | Linked records of the APDC and RBDM death registration data. APDC records for 2005-06 to 2007-08 and deaths to 30/9/2008 | Numerator-Number of deaths
Denominator- Number of cases for DRG N04Z. | Age, sex, comorbidity (Charlson index) and socioeconomic status. |

Note: APDC - NSW Admitted Patient Data Collection. RBDM - Registry of Births, Deaths and Marriages. A case represents a hospital admission for a specified condition. DRG - Diagnosis Related Group v 5.1. Charlson index (see Box 7.1). Socioeconomic status (see Box 7.1).

Source: NSW Health.
### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Abb.</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>95% confidence interval</td>
<td></td>
<td>A statistical term describing a range of values within which we are 95% certain that the true population value lies.</td>
</tr>
<tr>
<td>Abdominal hysterectomy</td>
<td></td>
<td>A procedure where the uterus is removed via direct open surgery on the lower abdomen.</td>
</tr>
<tr>
<td>Activity-based funding</td>
<td>ABF</td>
<td>Funding that is based on the projected amount and type of work of a facility, where standard prices are set for similar work undertaken. This has also been referred to as casemix or episode funding.</td>
</tr>
<tr>
<td>Acute care</td>
<td></td>
<td>Clinical services provided to admitted or non-admitted patients, including managing labour, curing illness or treating injury, performing surgery, relieving symptoms and/or reducing the severity of illness or injury, and performing diagnostic and therapeutic procedures. Most patients have acute or temporary ailments. The average length of stay is relatively short.</td>
</tr>
<tr>
<td>Adenomyosis</td>
<td></td>
<td>A condition where endometrial tissue that normally lines the uterus is present in the muscular walls of the uterus.</td>
</tr>
<tr>
<td>Admission</td>
<td></td>
<td>The process by which a person commences a period of residential care in a health facility.</td>
</tr>
<tr>
<td>Admitted Patient Data Collection</td>
<td>APDC</td>
<td>A database that covers all inpatient separations (discharges, transfers and deaths) from all Public (including Psychiatric), Private, and Repatriation Hospitals, Private Day Procedures Centres and Public Nursing Homes in NSW.</td>
</tr>
<tr>
<td>Agency for Clinical Innovation</td>
<td>ACI</td>
<td>A board-governed statutory health corporation that reports to the NSW Minister for Health and the Director-General of NSW Health.</td>
</tr>
<tr>
<td>Appendicectomy</td>
<td></td>
<td>Surgical excision of the patient's appendix.</td>
</tr>
<tr>
<td>Assistant In Nursing</td>
<td>AIN</td>
<td>An employee that is not a registered nurse, enrolled nurse or trainee nurse, who assists the Enrolled Nurses and Registered Nurses by providing basic nursing care, working within a plan of care under the supervision and direction of a Registered Nurse.</td>
</tr>
<tr>
<td>Australian Council on Healthcare Standards</td>
<td></td>
<td>An independent organisation dedicated to improving the quality of health care through performance reviews, assessment and accreditation.</td>
</tr>
<tr>
<td>Term</td>
<td>Abb.</td>
<td>Definition</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Average length of stay</td>
<td>ALOS</td>
<td>The average number of days each admitted patient stays in hospital. This is calculated by dividing the total number of occupied bed days for the period by the number of actual separations in the period.</td>
</tr>
<tr>
<td>Bankstown-Lidcombe Hospital</td>
<td>BLH</td>
<td>One of the study hospitals included in the review.</td>
</tr>
<tr>
<td>Bureau of Health Information</td>
<td>BHI</td>
<td>An independent, board-governed organisation established by the NSW Government to be the leading source of information on the performance of the public health system in NSW.</td>
</tr>
<tr>
<td>Carcinoma in situ</td>
<td></td>
<td>The presence of neoplastic cells or abnormal tissue that has not invaded surrounding tissues.</td>
</tr>
<tr>
<td>Casemix</td>
<td></td>
<td>The range and types of episodes of care of patients’ (the mix of cases) treated by a hospital. This provides a way of describing and comparing hospitals and other services for planning and managing health care. Casemix classifications put patients into DRGs with similar conditions that use similar health-care resources, so that the activity and cost-efficiency of different hospitals can be compared.</td>
</tr>
<tr>
<td>Casemix funding</td>
<td></td>
<td>See Activity-based funding.</td>
</tr>
<tr>
<td>Cholecystectomy</td>
<td></td>
<td>Excision of the gallbladder.</td>
</tr>
<tr>
<td>Clinical Excellence Commission</td>
<td>CEC</td>
<td>A board-governed statutory health corporation with the CEO reporting directly to the NSW Minister for Health. A key role of the Clinical Excellence Commission is building capacity for quality and safety improvement in Health Services.</td>
</tr>
<tr>
<td>Clinical Nurse Specialist</td>
<td>CNS</td>
<td>A Registered Nurse/Midwife who applies a high level of clinical nursing knowledge, experience and skills in providing complex nursing/midwifery care directed towards a specific area of practice, a defined population or defined service area, with minimum direct supervision.</td>
</tr>
<tr>
<td>Comorbidity</td>
<td></td>
<td>When a person has two or more health problems at the same time.</td>
</tr>
<tr>
<td>Computed tomography</td>
<td>CT scan</td>
<td>A non-invasive medical imaging method using X-rays and computer processing.</td>
</tr>
<tr>
<td>Diagnosis Related Group</td>
<td>DRG</td>
<td>A system used to classify hospital admissions into groups with similar clinical conditions (related diagnoses) and similar resource usage (hospital services). There are approximately 500 coding classes. In Australian acute hospitals, Australian refined DRGs are used (AR-DRGs). The classification categorises episodes into groups with similar conditions and similar usage of hospital resources, using information in the hospital morbidity record such as the diagnoses, procedures and demographic characteristics.</td>
</tr>
<tr>
<td>Endometrial ablation</td>
<td></td>
<td>Removal of the endometrium (mucus membrane lining) of the uterus.</td>
</tr>
<tr>
<td>Endometriosis</td>
<td></td>
<td>A condition where the mucous membrane lining the uterus (endometrium) occurs outside the uterus.</td>
</tr>
<tr>
<td>Term</td>
<td>Abb.</td>
<td>Definition</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Enrolled Nurse</td>
<td>EN</td>
<td>A person holding an Enrolled Nurse qualification who works under the supervision of a Registered Nurse to provide nursing care for patients in hospitals, nursing homes and a variety of other health care organisations.</td>
</tr>
<tr>
<td>Episode funding</td>
<td></td>
<td>See Activity-based funding.</td>
</tr>
<tr>
<td>Fibroids</td>
<td></td>
<td>Non-cancerous, muscular tumours that grow in the wall of the uterus.</td>
</tr>
<tr>
<td>Fluoroscopy</td>
<td></td>
<td>An imaging technique that provides real-time moving images of the internal structures of a patient through the use of a fluoroscope.</td>
</tr>
<tr>
<td>Gosford Hospital</td>
<td>GH</td>
<td>One of the study hospitals included in the review.</td>
</tr>
<tr>
<td>Health Information Exchange</td>
<td>HIE</td>
<td>A database maintained by the NSW Department of Health that contains a range of financial, patient and clinical information from hospitals and area health services.</td>
</tr>
<tr>
<td>High dependency unit</td>
<td>HDU</td>
<td>An area or environment in a hospital that provides a higher level of critical care and monitoring than is provided in a general ward, but a lower level of care provided by an intensive-care unit.</td>
</tr>
<tr>
<td>Hysterectomy</td>
<td></td>
<td>Surgical removal of the uterus.</td>
</tr>
<tr>
<td>Independent Pricing and Regulatory Tribunal of NSW</td>
<td>IPART</td>
<td>The independent economic regulator for NSW that is undertaking this hospital study.</td>
</tr>
<tr>
<td>Inpatient fraction</td>
<td>IFRAC</td>
<td>A measure used in casemix costing. The proportion of total (or operating) costs that are attributed to admitted patients.</td>
</tr>
<tr>
<td>Intensive care unit</td>
<td>ICU</td>
<td>An area or environment in a hospital that provides the highest level of critical care and monitoring.</td>
</tr>
<tr>
<td>John Hunter Hospital</td>
<td>JHH</td>
<td>One of the study hospitals included in the review.</td>
</tr>
<tr>
<td>Laparoscopic assisted vaginal hysterectomy</td>
<td></td>
<td>A surgical procedure where ligamentous attachments of the uterus are severed using laparoscopic tool and the uterus is removed through the vagina.</td>
</tr>
<tr>
<td>Laparoscopic hysterectomy</td>
<td></td>
<td>Removal of the uterus via small incisions through the abdomen.</td>
</tr>
<tr>
<td>Length of stay 1</td>
<td>LOS1</td>
<td>LOS1 is the episode length of stay in study hospital, ie, from the start of the episode to the end of the episode of care.</td>
</tr>
<tr>
<td>Length of stay 2</td>
<td>LOS2</td>
<td>LOS2 is the total length of stay in study hospital, ie, from admission to discharge at the study hospital.</td>
</tr>
<tr>
<td>Length of stay 3</td>
<td>LOS3</td>
<td>LOS3 is the total length of stay in study hospital plus up to 2 other hospitals - one transfer in and one transfer out.</td>
</tr>
<tr>
<td>Medical resonance imaging</td>
<td>MRI</td>
<td>A medical imaging technique most commonly used in radiology to visualise detailed internal structures of the body using a magnetic field.</td>
</tr>
<tr>
<td>Medicare Benefits Schedule</td>
<td>MBS</td>
<td>A listing of the Medicare services subsidised by the Australian government.</td>
</tr>
<tr>
<td>Term</td>
<td>Abb.</td>
<td>Definition</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>National Hospital Cost Data Collection</td>
<td>NHCDC</td>
<td>The NHCDC contains component costs per DRG based on patient-costed and cost-modelled information. The NHCDC enables DRG Cost Weights and average costs for DRGs for acute in-patients to be produced.</td>
</tr>
<tr>
<td>NSW Health</td>
<td></td>
<td>The broad term encompassing operational and other structures including the NSW Department of Health, Area Health Services, the Agency for Clinical Innovation, the Clinical Excellence Commission and a range of clinical taskforces.</td>
</tr>
<tr>
<td>Open Surgery</td>
<td></td>
<td>An invasive medical procedure where an incision is required for direct surgical access to the organs.</td>
</tr>
<tr>
<td>Principal referral hospital</td>
<td></td>
<td>Hospital within peer group (principal referral hospitals 1b) classified as an acute hospital, treating 25,000 or more acute casemix weighted separations per annum, with an average cost weight greater than 1 and 1 or fewer specialty services.</td>
</tr>
<tr>
<td>Principal tertiary referral hospital</td>
<td></td>
<td>Hospital within peer group (principal referral hospitals 1a) classified as an acute hospital, treating 25,000 or more acute casemix weighted separations per annum, with an average cost weight greater than 1 and having more than 1 specialty service.</td>
</tr>
<tr>
<td>Prophylaxis</td>
<td></td>
<td>Disease prevention, also called preventive treatment.</td>
</tr>
<tr>
<td>Registered nurse</td>
<td>RN</td>
<td>A qualified nurse who provides care for patients in a variety of healthcare settings. These include public and private hospitals, community and home-based services, nursing homes and industry.</td>
</tr>
<tr>
<td>Royal North Shore Hospital</td>
<td>RNSH</td>
<td>One of the study hospitals included in the review.</td>
</tr>
<tr>
<td>Royal Prince Alfred Hospital</td>
<td>RPAH</td>
<td>One of the study hospitals included in the review.</td>
</tr>
<tr>
<td>Tracheostomy</td>
<td></td>
<td>A surgical procedure to cut an opening into the trachea (windpipe) so that a tube can be inserted into the opening to assist breathing.</td>
</tr>
<tr>
<td>Uterine artery embolisation</td>
<td></td>
<td>A non-invasive form of treating fibroids via blocking arteries feeding the fibroids.</td>
</tr>
<tr>
<td>Vaginal hysterectomy</td>
<td></td>
<td>A hysterectomy procedure performed through the vagina.</td>
</tr>
</tbody>
</table>