

Appendix 1: Case studies of local benefits from using patient-level costing

Case study 1: York Teaching Hospital NHS Foundation Trust identified £160,000 additional income as part of its breast surgery review

The trust set up a 'deep dive' process to agree the income and expenditure treatment methods in the patient-level costing system, to identify areas of improvement and to check that the data were as expected. This was a rolling process which, over time, included all specialties across the trust.

Team working

The breast surgery review, led by the costing team, required input from one of the breast surgeons, the directorate management team and the finance manager for the service, with additional support from clinical coding when required. During the review, the breast surgeon identified that activity relating to one procedure, mastectomy with breast reconstruction, looked particularly low.

Recording review

All patients' notes were fully reviewed, focusing on which procedure and diagnosis codes had been recorded. The clinical coding of these patients resulted in the activity being attributed to one of four HRGs relating to breast procedures:

- JA07A: Major Breast Procedures category 2 with Major CC
- JA07B: Major Breast Procedures category 2 with Intermediate CC
- JA07C: Major Breast Procedures category 2 without CC
- JA09D: Intermediate Breast Procedures with Intermediate CC.

However, the surgeon expected that patients would be grouped to:

- JA16Z: Mastectomy with Breast Reconstruction.

Recording review

Analysis showed that the reconstruction element of the procedure had not been included in the patient coding. As a result, the procedure was classed as a major or intermediate breast procedure, instead of one with reconstruction, and the wrong HRG was generated. The team sought advice from the National Casemix Office to confirm the coding of these procedures should be corrected to JA16Z. Once this confirmation was received, the trust gave notice of the coding correction to commissioners and implemented the change.

Patient and financial benefit

The team calculated that this coding correction would increase income by £160,000 per year due to the higher tariff for the HRG JA16Z. This correction would also feed into more accurate patient-level costing data for the trust.

The correct payment for this activity contributed to a sustainable breast surgery service accessible to local patients. Introducing regular coding reviews embedded this type of analysis in the service and should help ensure other services are sustainable.

Acknowledgements: Our thanks to Victoria Pryszyk (Head of Service Line Reporting and Costing), Liz Hill (Directorate Manager for General Surgery and Urology), Boo Tse (Finance Manager – SLR and Costing), Sanya Basich (Finance and Performance Manager for General Surgery and Urology) and Ben Mancey-Jones (Breast Surgeon).

Case study 2: Lincolnshire Community Health Services NHS Trust: using PLICS to engage clinicians, share best practice and support decision-making

Lincolnshire's community trust implemented a patient-level costing system in 2011/12 and has been developing its systems and approach for several years. Around 90% of the trust's activity data are now collected and costed at the patient level. The trust has used these data to develop a range of activity and cost measures, including those in Table A1.1.

Table A1.1: Activity and finance metrics

Activity metrics	Finance metrics
Team structure and skill mix	Cost per contact
Number of contacts per day, duration of contacts and patient-facing time	Cost per patient
Patient-facing hourly profile of working day by individual and team	Cost per capita
Location of activity, ratio of clinic to home visits	Cost per type of intervention
Ratio of face-to-face and non face-to-face contacts	Profitability by business unit or team
Number of non-clinical activities performed by clinician and team	Number of interventions and cost of interventions per patient

Analysis

A reporting and analysis dashboard gives clinicians and managers across the trust access to these cost and activity data. The data can be analysed at all levels, from trust to individual patient, as well as by team or staff member.

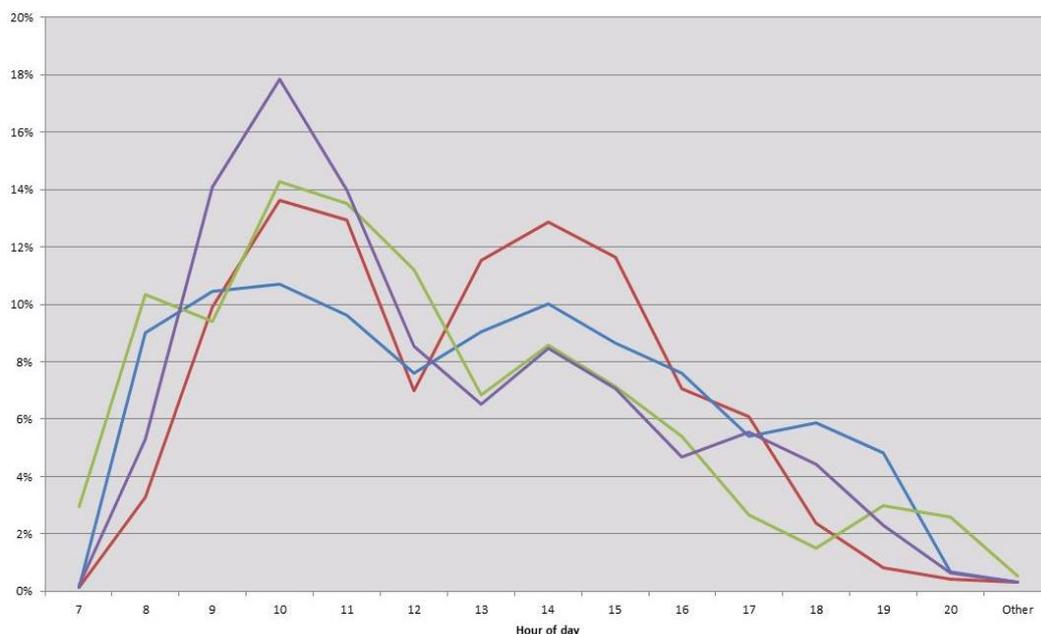
PLICS data are being used for numerous purposes, including:

- **Best practice:** clinicians and teams use the data to review their work. The data allow teams in a service to compare their skill mix, productivity and cost, which can help identify indicators of a 'best practice team'.
- **Tenders:** the data were used to give a quick, high-level view of the viability of a tender from a financial perspective.
- **Strategic direction:** the data are helping the trust to analyse the resource deployment and financial contribution of each service, informing strategic development.

The trust is increasingly using PLICS to engage clinicians in activity and cost discussions. Figures A1.1 and A1.2 give examples of how this information is being used.

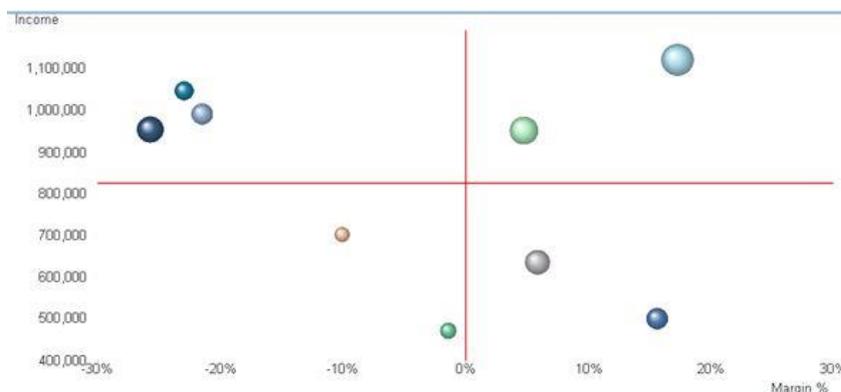
The activity-driven graph in Figure A1.1 shows the percentage of each team's time spent with patients by hour of the working day. This shows a clear morning peak in patient-facing time with a second, smaller peak after lunch. This type of information can raise questions about whether this trend is driven by staff availability or patient needs, and whether staff resources are appropriately distributed throughout the day for each of the teams.

Figure A1.1: Comparison of four teams' patient-facing time by hour



In Figure A1.2, each bubble represents a different team, and its size the number of patients seen by that team. The axes show the notional income and notional margin percentage for each team. For example, bubbles in the top right quadrant show that the team's notional income is higher than costs, and notional income generated is high. Bubbles in the top left quadrant show that costs of delivering the service are exceeding the notional income generated by the service. This clear display of information helps managers prioritise areas to review, identify what is influencing the costs of these services and look for potential cost efficiencies.

Figure A1.2: Portfolio matrix



Future developments

The trust is looking to develop its systems further to make better use of the activity and cost information across the organisation, in particular to:

- make the presentation of data more relevant to users
- capture patient-level data for every service provided by the trust
- complete the move to monthly reporting and embed the process in the finance team's monthly work plan
- build quality measures into the data to complement the quantitative financial metrics.

Acknowledgements: Our thanks to Matt Miles (SLR & Costing Accountant) and Beckie McConville (Locality Lead).

Case study 3: By reviewing its cancer drugs, Alder Hey Children's NHS Foundation Trust recovered the investment in its costing team for the year

The costing lead met with the clinical leads in several specialties to demonstrate his 'PLICS dashboard' functionality. In these meetings he identified individual cases

where the income received by the trust did not cover the costs of care for the patient, and used the dashboard to interrogate what was driving the costs.

Expert review

A meeting with one clinical director for haematology identified an oncology patient for whom the costs of care were significantly higher than income received. The patient had been treated with one drug that had a high cost associated with it. The knowledge that a particular oncology drug was driving the cost was the starting point to finding out whether the costing information was correct and if there were any opportunities to recover or reduce costs.

The costing lead contacted the head of contracting and commissioning to find out why the trust received no income for this high-cost drug. With help from the pharmacy assistant manager, they discovered the drug was eligible for reimbursement from the Cancer Drugs Fund (CDF) but had not been flagged in the pharmacy system, so no income had been received for it.

Process change

The team reviewed all CDF drugs and found other drugs eligible for reimbursement had not been flagged. The system was corrected and the trust now reviews the CDF drugs list regularly.

Impact of change

This small process change increased income by £90,000 that year. This is more than the cost of the costing staff, IT and software for the full year.

The review process should ensure any changes to funding are captured in future. This type of consistent approach will support the trust's financial sustainability and protect patient services.

Acknowledgements: Our thanks to Jason Dean (Costing Lead), Dr Mark Caswell (Clinical Director), Laurence Murphy (Head of Contracting and Commissioning) and Lisa Hegarty (Pharmacy Assistant Manager).

Case study 4: Liverpool Heart and Chest Hospital NHS Foundation Trust saved £547,000 through reduced device costs

The Liverpool Heart and Chest Hospital used patient-level costing data to reduce expenditure on high-cost devices without compromising clinical preference.

Cost data from PLICS were linked to the stock management system in cardiology theatres. This provided information on device usage for each theatre patient. Initially, over 7,000 device items were matched through PLICS – too many to be analysed. Further analysis focused on the devices that together accounted for approximately 85% of the device costs (100 to 150 devices). In particular, the analysis looked at

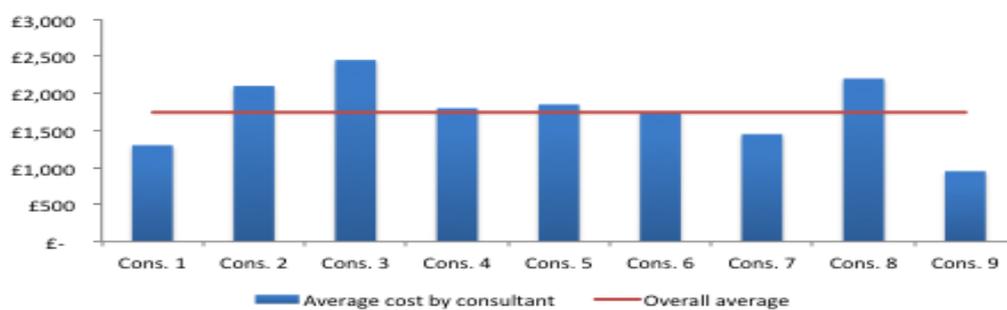
variation in costs between similar devices, and highlighted devices for which the variation was large. One such device was the heart valve.

Cost review

The patient-level data were used to benchmark the type of devices used by each consultant (Figure A1.3).

This revealed a large difference in the average cost of different heart valves, as well as in the heart valve cost by consultant (from £1,000 to £2,500).

Figure A1.3: Average heart valve cost by consultant



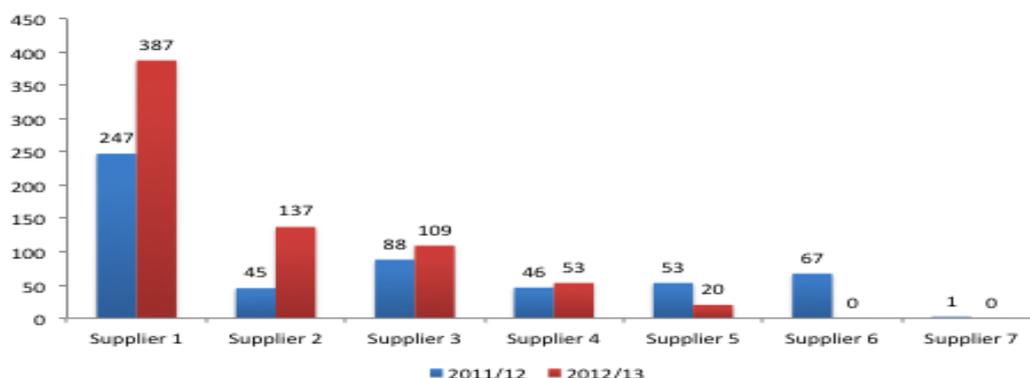
Clinical involvement

To understand what was driving these variations, the trust needed to know why different valves were being used in different scenarios; therefore, it was important to involve the consultant cardiologists. The director of finance met clinicians to highlight variances in the cost of heart valve procedures. This was followed by more detailed conversations about heart valve device usage between trust procurement representatives, the general manager for surgery, trust theatres manager and consultants. A range of valves was identified that addressed different clinical needs without compromising clinical preference.

Standardisation

At the time of this analysis, the trust was operating within a four-year framework agreement that allowed changes to be made to procurement. This meant that following the review, the trust stopped procuring devices from some suppliers and procured some devices from other suppliers for certain specifications only. The procurement of devices from the remaining suppliers increased (Figure A1.4).

Figure A1.4: Changes to procurement of heart valves



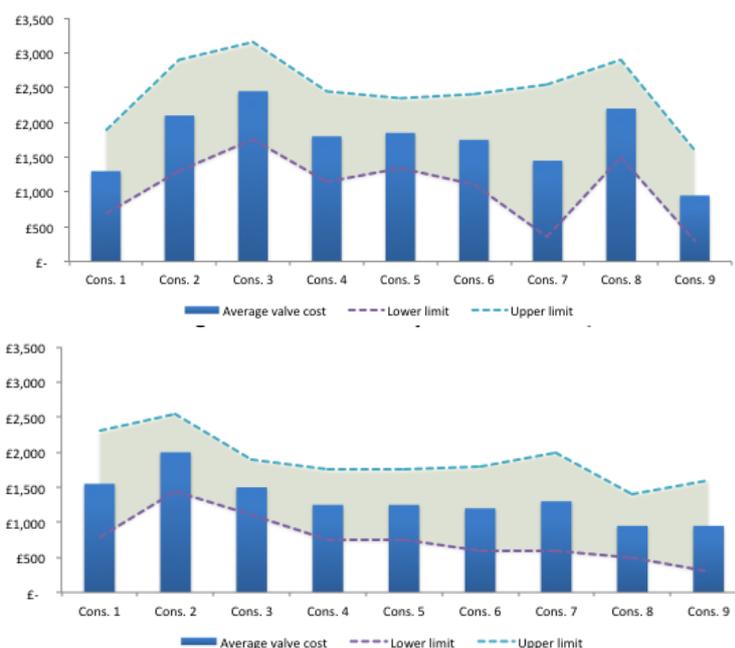
While it is likely that a commercial review with the valve suppliers would have yielded some cost reductions, the savings would not have been as significant without the standardisation and resulting increase in valve volumes from specific suppliers. This leverage arose directly from the opportunity identified by patient-level cost information.

Patient and financial benefits

The trust transferred the procurement of some heart valves from the most expensive supplier to cheaper suppliers, without adverse impact on patients and without compromising its legal obligations to the framework agreement.

Figure A1.5 shows the average cost of heart valves, by consultant, in the years before and after the review. In 2011/12 the average cost of a heart valve was £1,743; after the review this was reduced by £369 to £1,374 in 2012/13. The increased standardisation following review also reduced variation between consultants.

Figure A1.5: Average heart valve cost by consultant: 2011/12 (top) and 2012/13 (bottom)



Wider benefits

These reviews of device use and cost have been completed for several devices. The use of patient-level data in this type of review has given easy visibility to trends by consultant and between consultants across many devices. In particular, catheter use in the electrophysiology subspecialty was similarly reviewed. The savings on both heart valve and catheter procurement total £547,050 per year (Table A1.2).

Table A1.2: Savings on cardiac surgery and electrophysiology

	Cardiac surgery	Electrophysiology
Saving per patient	£369	£381
Number of patients per year	450	1000
Net savings	£166,050	£381,000
Total net savings per year	£547,050	

Acknowledgements: Our thanks to Ann Maher (Category Specialist Procurement Manager) and Gan Raman (Head of SLM Finance)

Case study 5: Stockport NHS Foundation Trust's ophthalmology service improved its financial position by £211,000

The ophthalmology service made a loss of £206,000 between April and September 2013, prompting the associate medical director for surgical services and critical care to launch an improvement project to achieve a surplus so that the trust could develop its ophthalmic services. The project involved all consultant ophthalmologists, nurses, allied health professionals and the divisional management team; its launch was chaired by the trust's chief executive.

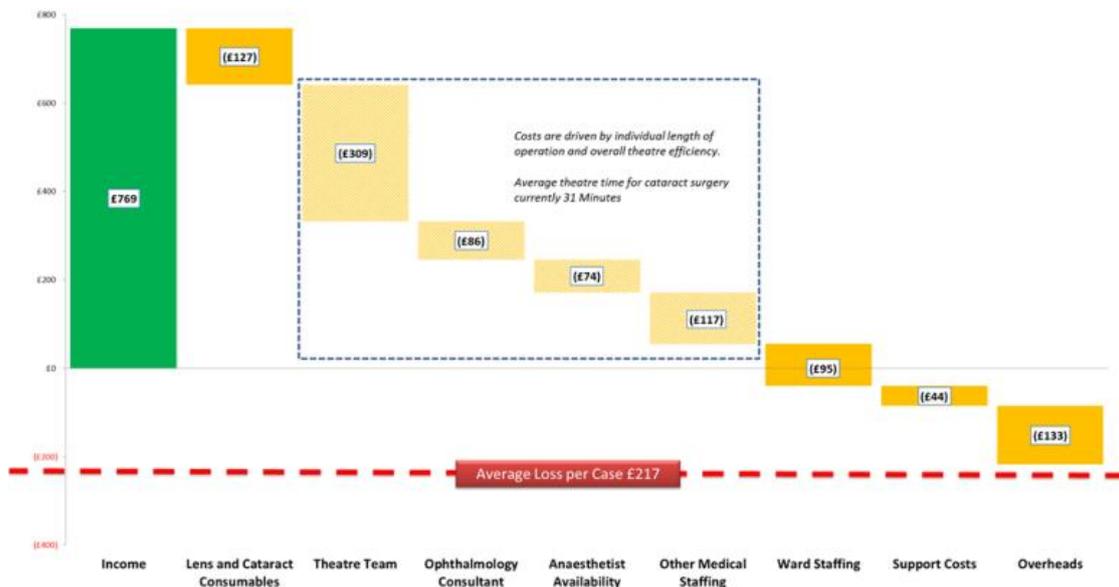
Cost analysis

The team used patient-level costing data to examine the costs of each procedure and identify the main 'cost drivers' among them. Day cases had contributed £173,000 of the £206,000 loss. Cataract surgery accounted for 46% of day cases and each cataract procedure was losing the service on average £217. Spending on theatres and medical staff involved in surgery accounted for 59% of costs, as shown in Figure A1.6 for April to September 2013. The team felt it could influence theatre utilisation cost and focused its attention on this.

Better theatre utilisation

Divisional management and clinicians reviewed theatre usage and found that a significant number of funded theatre minutes were not being used (either part or full sessions), mainly due to late starts and incomplete lists. This was increasing wait times, which led to an increase in work being outsourced to the private sector to try to meet access targets for surgery. This meant that the costs of running theatres and delivering the required activity were increasing, but without any increase in income.

Figure A1.6: Costs for cataract extraction and lens implant, April to September 2013



Measures were taken to increase utilisation of theatre sessions, including:

- changes to practice to ensure lists start on time
- review of casemix to move any suitable cases to the outpatient setting or outpatient treatment suite
- grouping patients requiring anaesthetist support on the list to reduce anaesthetist time.

As a result, the number of funded theatre lists that were not utilised fell, allowing a 15% increase in ophthalmology theatre activity in 2014/15 compared to 2013/14.

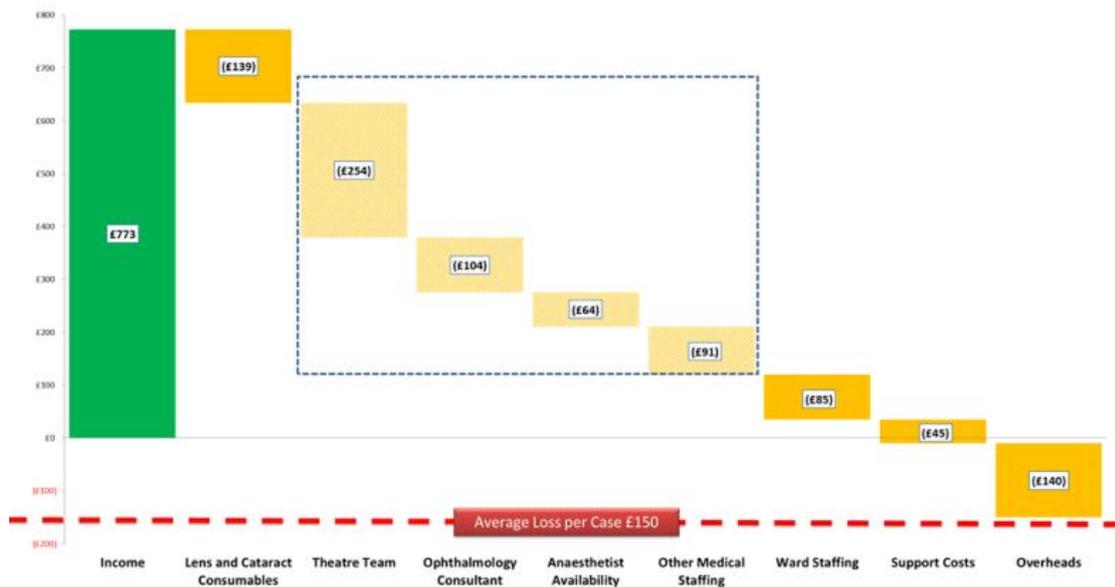
Patient and financial benefits

As costs have remained fairly stable, theatre costs per patient have effectively decreased by 12%. The loss incurred by each cataract day case procedure has been reduced to £150. This is shown in Figure A1.7 for costs for April to December 2014. Given that there are over 4,000 cataract day cases per year, this is a financial improvement of £211,000.

Patients have also benefited from the increased theatre activity as this has reduced:

- waiting times for cataract procedures, which can have a particularly significant impact on quality of life in this group of patients
- the number of patients being sent to other hospitals for their treatment: 140 patients were treated by other providers in 2013/14 compared to 11 in 2014/15, improving continuity of patient care.

Figure A1.7: Costs for cataract extraction and lens implant, April to December 2014



Acknowledgements: Our thanks to Karen Hatchell (Director of Surgery and Critical Care), Hayley Ringrose (Chief Financial Analyst) and Mr Colin Wasson (Associate Medical Director for Surgical Services and Critical Care).

Case study 6: Alder Hey Children’s NHS Foundation Trust increased its endocrinology capacity by 32% without increasing costs

In 2009/10 Alder Hey Children’s NHS Foundation Trust reviewed its paediatric endocrinology services, partly in response to British Society of Paediatric Endocrinology and Diabetes guidelines that patients on growth hormones should be seen in clinic every four months. The trust was not meeting this recommendation consistently for all patients and needed to increase outpatient attendances to rectify this. In addition, regional demand for the service, both inpatient and outpatient, was growing. As the endocrinology service was making a loss, it was necessary to look at the operating model and identify how capacity could be increased without adding to the financial pressure on the trust.

Patient-level costing is most effective when clinicians, costing experts and operational managers develop a shared view of a service. Alder Hey’s transformation director spent significant time with clinicians, using data from the service and from PLICS to report on the service’s costs. This helped the team to develop a strong working relationship based on respect and listening, as well as a joint understanding of the service and what the data were telling them about its costs.

Capacity review

The trust's transformation director together with clinicians looked for ways to increase activity without compromising patient care or increasing costs. Using PLICS data, they looked at the costs associated with each attendance. This highlighted a cost difference between nurse-led and consultant-led attendances. Adjusting the service delivery model so that nursing staff did more would allow capacity to be increased without significantly increasing costs.

To realise this, the consultants trained the senior nurse specialist and advanced nurse practitioner to work more independently. This allowed nursing staff to contribute more effectively to the care of inpatients, as well as to see more patients on their own in clinics. Between 2009/10 and 2014/15, numbers of nurse-led clinics rose from 223 to 867, an average 31% year-on-year increase.

In addition, a new associate specialist was recruited, initially seeing patients under the supervision of a consultant, but then moving to seeing patients on their own. These changes ensured that significantly more patients were seen, with little increase in staff cost.

Cost analysis

A review of patient costs by type of expenditure identified that growth hormones accounted for two-thirds of the direct and indirect cost base. When clinicians analysed the use of these drugs, they identified inconsistency in the age at which patients were transferred from the paediatric to the adult service. Those who transferred to the adult service at a later age received the growth hormone treatment for longer. In addition, research showed that if a patient didn't demonstrate significant benefits from growth hormones within a year there would not be a benefit. In response to this, the clinicians introduced procedures to ensure transfer of patients to the adult service when clinically appropriate.

Impact of changes

As a result of the above changes, British Society of Paediatric Endocrinology and Diabetes guidelines are met, and in 2011/12 the service delivered 55% more inpatient activity and 27% more outpatient activity than in 2009/10. Drug costs have remained stable despite the increase in patients. Despite the significant increase in capacity, costs for the service did not increase during this period.

Ongoing analysis has shown that the quality metrics have been maintained or improved. For example, the standardised readmission rate reduced from 35.79% to 29.55% between 2011/12 and 2014/15, the best for the four specialist children's trusts in England.

Acknowledgements: Our thanks to Mohamed Didi (Consultant Paediatric Endocrinologist) and Jason Dean (Costing Lead).

Case study 7: Nottingham University Hospitals NHS Trust’s better theatre utilisation, reduced length of stay and increased elective activity improved the burns and plastic service’s finances by £1.4 million

Over the last four years, the whole trust has been involved in developing its patient-level costing approach, from including clinicians in the team selecting the system to setting up a data-quality panel involving all professions.

PLICS generates simple and easily understood tables and charts for performance dashboards. Clinicians across the trust can access and interrogate this cost information about their patients. Any clinician responsible for a service is expected to understand the patient-level data.

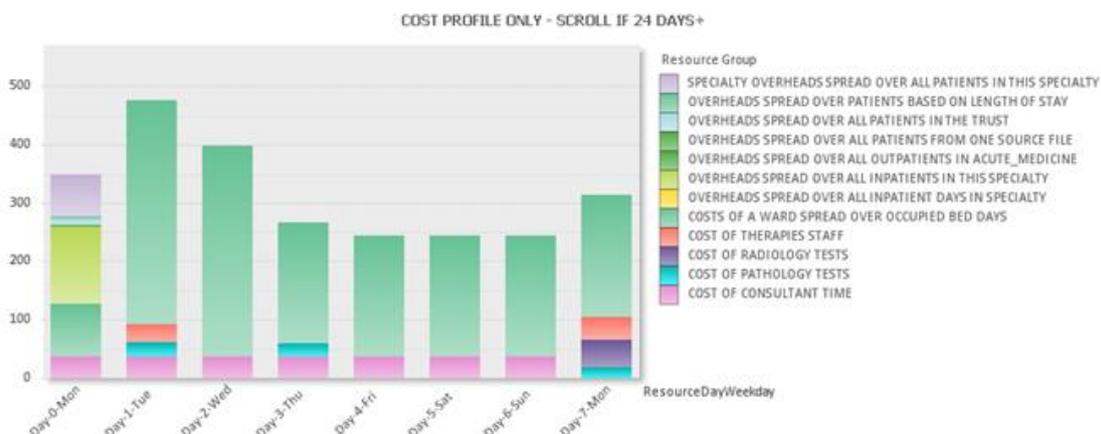
A trust-wide transformation team, known as ‘Better for You’, helps services resolve any queries raised by the patient-level costing information. It has worked with burns and plastics, a service that was making a loss.

Financial improvements

Senior burns and plastics clinicians reviewed the PLICS-generated performance dashboards to identify the activities having greatest impact on the costs of the service. In particular, they looked at the ‘costs per day’ dashboard (Figure A1.8) to identify trends in costs through each inpatient spell. It can be seen that:

- early in the spell, a range of professional interventions and patient care activities introduce costs
- in the middle of the spell, costs are mainly associated with bed occupation, not professional interventions
- towards discharge, professional costs increase.

Figure A1.8 ‘Cost per day’ dashboard



This analysis was then used to explore a number of options to improve financial performance:

- **Recording activity:** Clinicians identified activities that were not reimbursed. Working with the coding and information team, operational managers revised recording procedures to ensure clinicians recorded all procedures appropriately. The process was agreed with the commissioners to ensure that the trust was appropriately reimbursed as a result of the improvement in recording.
- **Length of stay:** Costs of an episode increased as the length of stay increased. The trust set a length of stay 'trim point' that, when crossed, triggered a clinical review of the patient's fitness to be discharged. This prompted earlier engagement with the wider health community so that a fit patient could be discharged without delay.
- **Pathway review:** The data showed that a number of patients referred from the emergency department (ED) to the burns unit could have been treated as outpatients. To reduce these inappropriate referrals, the team devised a telehealth solution in which ED staff contact burns nurses via webcam for a remote assessment of their patient and decision on the appropriate care pathway. This has resulted in more patients being treated as day cases or outpatients, and a drastic reduction in burns admissions.
- **Theatre utilisation:** The improved patient pathway led to more elective procedures, allowing better planning of theatre time. Patient-level information and the theatre-scheduling feeder systems were used to complete a detailed analysis of clinician performance, including peer comparison. This identified significant variation in the time taken and hence cost of surgery. This was used to challenge clinicians, with an emphasis on identifying best practice and improving performance. A surgery time standard is now set for each procedure based on a break-even tariff point. For example, if costs exceed the tariff once theatre time runs over 30 minutes, this is the time set as the standard. Exceeding the standard triggers discussion about the reasons why. As a result, theatre recharge for burns and plastics has been reduced by £650,000 per year. Importantly, the more efficient use of theatres by burns and plastics has released surgery capacity across the trust.

Impact of changes on patient care

While this work has realised financial efficiencies, the aim of this senior clinician-led project was to establish best practice to improve patient care. Several benefits to the patient experience and care can be identified:

- reduced length of stay and more timely arrangement of post-discharge care
- more timely intervention as a result of reduced admissions to the burns and plastics unit, and improvements to day case and theatre scheduling

- an 11% shift in activity from non-elective to day case and elective activity; this reduced pressure on beds and waiting times, as well as theatre delays and cancellations
- increased professionalism from the challenge to clinical performance and influence of senior clinicians leading these reforms, re-enforced by setting and monitoring standards. Reputation and quality of service have greatly improved, as reflected in the friends and family test results.

The financial impact of each of these changes is difficult to quantify. However, the financial position of the service has improved by around £1.4 million per year following all these changes.

Acknowledgements: Our thanks to Jason Neil-Dwyer (Surgeon, Plastics), Scott Hodgson (Head of Costing) and Duncan Orme (Deputy Director of Finance).

Case study 8: Alder Hey Children's NHS Foundation Trust has improved patient outcomes and predicts 6,000 bed days a year will be released by redesigning its rehabilitation service

The Alder Hey service-line reporting (SLR) system showed the neurology service to be 21% in deficit, prompting a review of the service. Patient-level costing data and SLR data were used in a detailed review of all costs to identify ways to make this service financially sustainable.

Patient pathway

The service lead for neurology and a cost accountant reviewed care interventions along the neurology pathway. They identified that patients were receiving treatment from therapists after discharge, which was not covered by the inpatient tariff or by a separate outpatient tariff. This treatment was incurring costs for the trust without reimbursement. Further analysis of patient-level data showed ten patients accounted for half the service's financial loss. All of these patients had lengths of stay over 55 days and received intensive rehabilitation therapy during their inpatient spell. While the trust received some income for the excess bed days, this did not cover the rehabilitation costs.

As neurology was not the only service where patients received rehabilitation, the review was widened across the trust. This identified similar patterns in other specialties: trust-wide 26% of bed days related to only 123 patients (<1% of patients).

In addition, the rehabilitation approach was inconsistent across wards, with patients starting rehabilitation at different points in their care and having different arrangements for care post-discharge. There was inconsistency in reimbursement too, with separate funding for adult rehabilitation but not for paediatric rehabilitation.

Proposals for change

Rehabilitation teams, clinical specialists and costing accountants developed proposals to redesign the delivery of paediatric rehabilitation throughout the trust. The revised model includes:

- a specialist rehabilitation ward and team for the first stage of a patient's rehabilitation, to ensure all patients receive consistent specialist care
- rehabilitation is begun earlier in each patient's stay, resulting in quicker discharge
- a specialist transitional unit for the most seriously affected patients, to allow the team to continue rehabilitation and work closely with the patient and family, including planning care post-discharge. While on the unit, parents gradually take over their child's care.

Following discussion with commissioners, the specialist rehabilitation ward has now been opened and introduction of the transitional unit is under consideration.

Impact of changes on patients and finances

This new model is already bringing many benefits for patients and the trust:

- patients receive the right care, at the right time and in the right place
- length of stay is reduced through earlier intervention and there is a focus on needs post-discharge
- staff time and skills are used more efficiently across the trust through a more consistent and co-ordinated rehabilitation service
- improved outcomes for children undergoing rehabilitation.

When fully implemented, the specialist transitional unit is expected to build the family's skills and confidence as carers: families will start to take over their child's care while they are still on the rehabilitation ward. This will empower them to meet their child's needs once they return home; it also equips them to identify if their child's condition changes and they need to seek advice from the rehabilitation team or have their child readmitted.

Earlier discharge is expected to release up to 6,000 bed days per year. This will have a significant impact on the region's paediatric inpatient capacity. The improvement in clinical outcomes should reduce the need for future interventions, reducing costs across both the acute and community settings.

Acknowledgements: Our thanks to Jason Dean (Costing Lead), Dr Ram Kumar (Service Lead, Neurology) and Andy McColl (Business Development Manager).