A new cardiothoracic centre: 'how to do it?'

Terence Lewis, Simon Allen, James Kuo, Jonathan Unsworth-White

All cardiac surgical patients, emergency and routine, from the South West peninsula of England had to travel long distances until 19 months ago, a stressful if not dangerous situation. This paper describes the planning, commissioning and start-up of a brand new cardiac surgical facility. The lessons learnt may help similar projects as provision of specialist health care decentralizes.

The South West Cardiothoracic Centre at Derriford Hospital, Plymouth is 18 months old and has now completed 1300 major cardiac procedures. The planning, building, commissioning and initial activity of this brand new facility has been an enormous undertaking, not only for the clinical staff directly involved, but also for the management and the rest of this hospital. This would seem a suitable stage to review the whole process, and recognize the concepts that have worked and those which have been less successful.

To those involved from the outset, the enterprise has been incredibly rewarding and the levels of activity and results produced by the unit have shown the NHS at its best, while obviously exposing difficulties.

The overall concept cannot be faulted. The resident population of the South West peninsula is 1.6 million, including areas with a high incidence of cardiac disease, but this does not include the high-season weekly influx of 270 000 visitors in Cornwall and 290 000 in Devon who create a significant emergency workload.

PREVIOUS PROVISION OF SERVICES

In the past all cardiac surgical services were purchased from distant units in London and elsewhere. This distant provision had advantages; namely the saving on the capital expenditure of creating a local unit, the revenue historically funded by the previous provider units, and the high standard of surgery.

The disadvantages were significant, not least the distressing difficulties faced by patients and relatives travelling great distances for dangerous surgery to cities that were strange to them and far from their own supportive communities. These difficulties often became intolerable with complications and/or death. Once the purchaser/provider relationship had emerged and funding changed, it became clear that large amounts of money were leaving the area to deal with the most common disease process affecting the population. Clinical, local and political aims combined, leading to a decision in 1995 by the then Secretary of State to create a new cardiac surgical unit in the West Country.

Derriford Hospital, Plymouth, one of the largest acute hospitals on one site in Europe, was eventually chosen. The case was reinforced by its rail and road communications and by its relatively central geographical situation within the peninsula. A planning team was set up by the chief executive, which was run by the senior planning officer, together with a full-time project manager. The plan was to amalgamate existing thoracic surgical and secondary cardiological services with newly provided cardiac surgery and interventional cardiology.

A consultant cardiothoracic surgeon who had been established at one of the historical provider units for nearly 20 years was involved from an early stage, initially informally, later on a sessional basis and eventually full-time. This surgeon had a knowledge of local arrangements, as a result of outreach clinics and close personal referral arrangements. There was considerable input from a number of local and distant clinical, nursing and technical sources and from a number of established units, particularly Oxford and St Bartholomew's/The Royal London.

The process was driven by a detailed and demanding formal agenda and timescale and it says a great deal for those involved that it opened on time (November 1997) and in good

Mr Terence Lewis, Mr Simon Allen, Mr James Kuo and **Mr Jonathan Unsworth-White** are Consultant Cardiothoracic Surgeons in the South West Cardiothoracic Centre, Derriford Hospital, Plymouth PL6 8DH

Correspondence to: Mr T Lewis

order. Just over a year and 1 300 major cardiac cases later, the unit has had to achieve a far higher workload than was envisaged by either purchaser or intended providers. The clinical preoperative risk analysis of these patients in the first complete year's activity has been uncomfortably high (mean Parsonnet score 7.2), but the unit has produced excellent results, comparing well with the best of long-established units (all-patient crude 30-day mortality 2.1% and 0.9% for elective coronary artery bypass grafting). Overall the unit has been an outstanding success, not least because of the enthusiasm and commitment of the whole range of staff involved.

It is now an appropriate time to consider which parts of the design and commissioning stages worked and which could have been improved.

SIZE OF UNIT

It would seem to be stating the glaringly obvious to say that provision of a new clinical service should be of a size appropriate for the clinical requirement of the intended catchment area. That is certainly true, but how can this be calculated in the planning stage? The figure arrived at depends on inputs from groups with different perspectives.

Good financial trust management, which we have, will only countenance providing capacity for a level of activity predicted, and close to promised, by the various purchasers. Purchasers have difficulty, in present conditions, predicting a total expenditure much more than that of last year's outcome and usually cannot commit themselves totally to anything more than the next financial year, and even this, often at the last minute. Any increase in one clinical activity is often reflected, of necessity, by a reduction elsewhere. These financial constraints are real, but can be, and were in our case, confusing.

Purchaser predictions of volume for a service previously not locally available are bound to underestimate the requirements, despite best intentions. Patients, GPs and to a certain extent referring physicians, are each in turn less likely to fight through a system with an endpoint delivered remotely. Over the years this produces an ever increasing backlog which boils over with the arrival of local provision. This has been particularly true for cardiac surgery in the South West and the surge in demand, once opened, far exceeded the predictions of everyone.

When levels of activity for the peninsula for the last 9 years are subtracted from the British Cardiac Society 1994 recommendations (*Figure 1*), the accumulated shortfall in our population is in excess of 4 500 cases, in addition to a high rate of new cases. Many of these backlog patients by definition have advanced disease and present as unstable patients requiring urgent surgery, bypassing the waiting list and producing a high level of emergency/urgent work (60% in this unit). The National Health Service Framework document for cardiac disease will recommend levels of intervention, both surgical and cardiological, likely to be well in excess of most present provision nationwide.

There is another way to plan the size of a unit — from junior medical staffing levels up. In order to do an emergency cardiac operation in the middle of the night, and fulfil manpower rules, an on-call rota needs to have a consultant surgeon, a career higher surgical trainee, usually as first assistant, a basic surgical trainee, partly to help and partly to cover the wards, a consultant anaesthetist in theatre and a specialist registrar (SpR) in anaesthesia, partly in theatre and partly in the cardiac surgical intensive therapy unit (ITU). Such a rota requires five, possibly six, basic surgical trainees, four possibly five higher surgical trainees, five SpRs in anaesthesia and at least four, but probably five consultant cardiac surgeons. On top of this, full rotas of consultant cardiac anaesthetists, theatre nursing staff, clinical perfusion and operating department assistants are required.

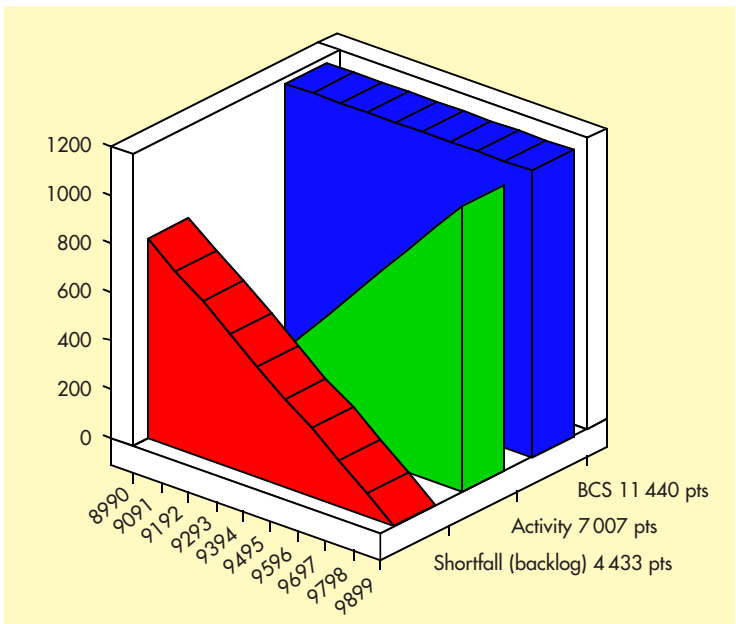

Figure 1. British Cardiac Society (BCS) suggested rates of cardiac surgery compared to activity per million of population 1989–1999. Figures adjusted for a population of 1.7 million.

By definition this creates a large unit, which in order to pay for itself needs a considerable capacity, probably three theatres and a throughput of 1300–1500 cardiac cases per year, plus the full range of thoracic surgery. Anything smaller may be unsustainable, both financially and in terms of manpower, and might well fail to thrive in the long term. A planned unit of this size needs to have a population sufficiently large to generate these numbers.

For this new centre these numbers appear to add up, with enough activity to fully occupy the staffing structure, the three operating theatre cardiothoracic surgical suite, nine-bedded cardiac surgical ITU and four cardiac high dependency unit (HDU) beds, together with thoracic surgical recovery and HDU. Initially there were not enough ward beds, but this has been rectified.

Working upwards from sustainable staffing levels has by chance provided the right-sized surgical unit to serve the population and provide levels of activity in line with what must be taken as minimum national strike rates. Revisiting this process we believe that we should have taken much more care in assessing the demand for cardiac surgery, despite the associated difficulties.

STAFFING

Medical staff numbers to provide a sustainable critical mass have already been discussed, but cardiac surgery is a team game with a large number of people with different skills required. The whole team is totally interdependent, and is only as strong as its weakest member.

At the outset of the process some of the planning management undoubtedly believed that an entire London unit, presumably excess to requirement and in need of golf courses and marinas, would decamp to the West Country on the back of the first advertisement. Needless to say this did not happen. The provision of cardiac services in the UK is very low compared to the rest of Europe and the developed world. Most units are expanding, with a number of new units coming on line. Trained staff of all types, medical, nursing, clinical perfusion, physiotherapy and technical, are like gold dust and will only move for professional advancement to a well set-up unit offering a coherent career structure. It has been a painful process to get this accepted.

Enhancement of activity means more facilities, which are relatively easy to provide. It also means more skilled staff which are not and take time to recruit. Cardiac surgery, like other specialized services, cannot be turned on like a tap overnight, certainly not in response to a dramatic rise in contracts proposed on March 31 for the next financial year. Good staff take time to recruit, even for an excellent unit like this. Frugal financial management means no excess capacity. Excess capacity provides flexibility, which is not seen in the NHS, except in units losing contracts and down sizing. Hopefully new purchasing arrangements will become more sympathetic and avoid short-term last minute fluctuations which are difficult to cater for in an efficient unit.

Last minute financial constraints, which afflict the plans of many trusts, forced the planning management to reduce staffing numbers and grades and to down grade or cancel some vital equipment, which was unfortunately done without discussion with the clinical staff involved in the planning process. Most of these changes have had to be reversed, causing a certain amount of acrimony and expense. These kind of constraints need to be addressed by everyone included in the planning process. Similarly, management made a number of vital decisions on the structure of the unit, despite clinical advice to the contrary, loosely based on Oxford's model (Wallji et al, 1999), which would not have been sustainable and would have had to change.

The planning structure for such an enterprise is crucial. There must first be a firm understanding and commitment to the project at chief executive and trust board level, which we had. Second the planning management, nursing, technical, and clinical staff must be totally open with each other from the onset, which we did not entirely achieve. Clinical input must also be realistic, mindful of local circumstances and finances, and neither didactic nor confrontational. When necessary, outside advice must be sought, but such individuals must be chosen carefully for these reasons.

The key clinical staff, lead surgeon and chief nurse, should have started work on site earlier, although this was practically difficult for those concerned. Ideally the middle management and most of the clinical staff involved in planning the unit should stay on through the commissioning process to make the unit work, at least in the medium term. However, it has to be said, that if the full scale of the project had been fully understood in advance by purchasers and local management, the centre might never have happened.

Extending the role of all types of staff has been a priority to increase job satisfaction and enhance recruitment and retention.

Anaesthetists are increasingly responsible for the in-theatre transoesophageal echocardiography service with cardiological back-up. Operating department assistants run the monitoring and insert arterial lines. There is a programme about to start designed to enable them to train as operating assistants, including harvesting of saphenous vein and radial artery conduits. An F grade nurse acts as activity coordinator for the whole unit, both surgically and cardiologically, which maximizes the use of facilities and helps to maintain good relations with our sister institutions. Our new ward (now commissioned) is nursed by F grade trained staff, together with B grade health-care assistants. There is already an integrated cardiothoracic nursing course rotating through all the activities of the directorate.

UNIT STRUCTURE

It was decided early on in the process that the unit needed to be considered as a facility for the whole peninsula and not just as a department of Derriford Hospital. We needed to make our sister institutions feel very much part of the enterprise, hence the name South West Cardiothoracic Centre. The centre is a separate directorate with separate theatres, catheter laboratory, cardiac ITU, HDU and thoracic recovery. Our wards, although principally cardiac surgical, thoracic surgical and cardiological, are all shared where necessary and no bed 'belongs' to an individual consultant. Coronary care will probably become integrated into the directorate, having been part of general medicine to date.

CARDIOLOGY

The plans for cardiology, particularly secondary cardiology, have been less successful. The impact of surgery on secondary cardiology was seriously underestimated, particularly as the referral rate of surgical emergencies is about 60%. These patients have demanding cardiological needs while waiting for surgery. This has been aggravated by the interventional cardiological throughput. In addition one catheter laboratory is insufficient for a comprehensive interventional programme, together with a routine diagnostic service 365 days a year.

ANAESTHESIA

The centre has seven cardiothoracic anaesthetists within the directorate structure, allowing them to be very much an integrated part of the process including its management. Day to day control of the cardiac ITU is led by a consultant anaesthetist on rotation, but care is very much shared with the surgeons. In 18 months we have lost very few operating slots for lack of an anaesthetist and the system works well.

RELATIONSHIPS WITH EXISTING DEPARTMENTS/ASSOCIATED UNITS

Cardiac surgery could be compared to a tumour that does not generally metastasize, but is certainly locally invasive. The effects of its activities on other units within the hospital must be carefully considered well in advance. In our case the necessity to grow far faster than planned has put considerable strain on a number of other departments, particularly blood transfusion, pathology and imaging. It says a great deal for these departments that they have managed so very well. Relationships with sister cardiology units within our natural catchment area are also very important. These cardiology departments have invariably built up professionally close relationships with existing surgical centres of excellence over many years, which they would seem to be expected to abruptly sever. This must be dealt with sensitively, which we did not entirely achieve.

PRIVATE PRACTICE

Private practice can produce great tensions throughout a cardiac surgical department. We have tried to look at this constructively. The trust wanted private activity within the hospital for good financial reasons and initially wanted the consultant surgical staff to be contracted in that way. We thought this professionally inappropriate, but have settled on a letter of agreement to implement this concept, provided the facilities are excellent and in no way constraining.

As a group of surgeons we work as a partnership, as we do for our NHS activity. This will create net gainers and net recipients at different stages of career, defuses many potential problems, and has so far worked excellently. It has been set up in such a way as to provide a degree of financial stability during illness, suspension, dying or retiring and this has been laid out in a formal agreement. Significant profits from the private ward have been ploughed back into the general provision of the hospital. These arrangements have the added clinical advantage to the whole unit of avoiding the necessity for consultants to travel away from the hospital campus to undertake private practice.

RANGE OF ACTIVITY AND RESEARCH

As already alluded to, different parts of the NHS process, purchaser, trust management and clinicians, all have different ideas of what the unit

should provide. The patient wants easy access to the widest range of expertise of the highest standard. That is exactly what recruitment and retention of clinical staff of all types needs as well. Research is a problem. Large new regional hospitals, such as Derriford, which are increasingly becoming the backbone of health provision usually do not have the endowments of longer established institutions and are fully stretched in terms of both finances and space. Anything spare quite rightly goes into clinical services.

However, if quality as well as quantity of health care is to be sustained and remain equitable throughout the UK, facilities for research must be provided. This is particularly true in our speciality, and as a priority, we have started by setting up a cardiovascular research group involving cardiac surgery, vascular surgery, cardiology, cardiac anaesthesia, vascular anaesthesia, clinical perfusion and cardiovascular nursing, and have rented premises on the science park next to the hospital. Hopefully permanent research premises on the hospital campus will soon be provided.

LEVELS OF ACTIVITY AND WAITING LISTS

The unit was planned to achieve 200 cases in the first 5 months, 700 in the first financial year and 1000 in the second financial year. Because of the unexpected demand already discussed, these numbers were exceeded (268, 851, 1160 respectively). Even so we have not been able to expand as fast as required, and the purchasers have had to purchase work outside the region to the disappointment of ourselves, our referrers and our patients, many of whom are now unwilling to travel to other units.

Our waiting lists have grown from an inherited 130 at the time of opening to 620 at 18 months. To service the population properly we probably need to grow to at least 1800 cardiac cases per year as rapidly as possible and to carefully plan the strike rate necessary for the future once the backlog has been dealt with. To this end a Peninsula Planning Group for Cardiac Services has been set up.

STARTING

It would have been prudent to stage manage the initial activity of a new unit, limiting volume and complexity of cases. We tried to do this, but were wholly unsuccessful. We did eight routine cases in the first week and 18 in the second, including unstable coronaries, a post-ischaemic ventricular septal defect, an emergency aortic root and an arch replacement. Emergency surgery is often the most complicated and highest risk and is also the least likely to be acceptable to be sent further afield.

A new cardiac surgical unit needs to be able to deal with the full range of work at target rate from the outset, and this means that it must be fully equipped and sustainably staffed with a substantial core of fully trained cardiac nurses and technical staff from day one. It undoubtedly helped to open the doors with three experienced consultant surgeons. The cardiac surgical throughput of the unit has now reached 27 cases in a good week and continues, of necessity, to grow.

CONCLUSIONS

The South West Cardiothoracic Centre has completed its first 1 300 cases with excellent results and in excellent shape, which is a fitting testament to the tenacity, over nearly 20 years, of a small number of local clinicians and latterly senior management, and most recently, to everybody involved in planning, commissioning and opening the unit. We have made some mistakes and would do certain things differently another time. It is hoped that this paper will help those repeating this exercise elsewhere, and we feel the principal lessons learnt concerning a unit's viable size and a realistic assessment of the needs for its services can be applied to many clinical developments. HM

Wallji S, Peterson RJ, Neis P et al (1999) Ultra-fast track hospital discharge using conventional cardiac surgical techniques. *Ann Thoracic Surg* **67(2):** 363–70

KEY POINTS

- Planning, commissioning and start-up phases of a new surgical services, which was not previously provided locally, are described.
- The probable viable size of such a new unit in the UK is discussed.
- Innovative approaches to the provision of anaesthesia, private practice and the extended role of various staff groups are presented.
- The principal error of all concerned was the underestimation of the volume of surgery required of the service, probably a reflection of the backlog accumulated with no local provision.