

Health

Acute hospital portfolio

 audit
commission

Operating theatres

Review of national findings

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Background

- 1 Surgical operations are an important part of acute hospital activity. For many patients they are the sole reason for admission to hospital.
- 2 In 2001/02 nearly 7 million operations were performed on patients admitted to hospitals in England and Wales (**Ref. 1**). Most were 'elective' patients admitted from surgical waiting lists, but some patients who were admitted as emergencies also required an operation.
- 3 Much surgery is technically complex and requires a range of people with different skills to be in one place. These include one or more surgeons, one or more anaesthetists, as well as special theatre nurses and practitioners and a range of assistants and technicians. Staff from other departments, such as radiology or pathology, are also sometimes required. Many of these staff are involved in preparing patients for operations and in moving them in to and out of theatres at the right time. Gathering the right people at the right time in the right place is difficult enough in itself, but it is only half the battle. They have to work together in harmony, with common goals and agreed standards. Each person must not only be skilled in his or her own role, but must also understand and co-ordinate with others' roles. As well as the people, a wide range of consumables (from syringes to replacement hip joints) and equipment (from surgical instruments to operating microscopes) have to be assembled without fail.
- 4 All of this complexity has three important consequences:
 - Sometimes a key resource is not available and the operation has to be cancelled, affecting patients directly. More than 3 per cent of planned operations are cancelled by the hospital on the day of operation.¹
 - Operating theatres use a significant proportion of the total resources of the hospital. It costs around £0.8 million to build and equip one operating theatre (**Ref. 2**). Annual budgets for the main theatre departments in acute trusts in England and Wales total well over £1 billion (between £1 and £16 million in each trust).¹
 - Running theatres carries risk. Patient safety is paramount and this requires robust systems of quality assurance and monitoring, as well as adequate resources.
- 5 It is not enough to have high-quality, efficient theatre facilities. There must also be sufficient numbers of theatres. A lack of theatre space has a direct impact on patients if it means that not enough operating lists are planned to keep up with demand. This can lead to less successful outcomes if the patient's condition deteriorates over time and waiting lists will be longer than they otherwise might. Of course, theatres can be rendered inefficient by bottlenecks elsewhere in the hospital. For example, major operations may have to be cancelled if there is no intensive care bed available for post-operative care.

¹ Estimated from the survey undertaken for this review.

- 6 About three-quarters of all surgery is carried out on waiting list patients, who are allocated to scheduled elective operating lists. For these patients the precise timing can be adjusted, although the degree of flexibility does vary according to the particular condition. So, for example, much cancer surgery, although not by definition an 'emergency', must nevertheless be carried out at the earliest opportunity.
- 7 The other one-quarter of surgery involves trauma or emergency cases that arrive from the accident and emergency department with very little, or no, warning, for example, fractured hips or road traffic accident cases. In large hospitals there is sufficient emergency surgery for them to schedule operation time for this work too, mainly in the daytime. However, trauma and emergency cases also occur at other times and at weekends. The necessary surgery is then performed as a 'one off' in any theatre that is available – the so-called 'unscheduled' cases. In some smaller hospitals no sessions are scheduled for trauma and emergency at any time – these operations are all carried out on an ad hoc basis. And occasionally elective or waiting list surgery is performed off the scheduled list, for example, if a patient's operation is postponed to the next day because doctors have run out of theatre time on a scheduled list (**Exhibit 1**).

Exhibit 1

Approximate percentages of all operations that are on scheduled or unscheduled lists

		Type of patient	
		Elective or scheduled	Trauma or emergency
Type of list	Scheduled list	73	12
	Unscheduled list	4	11

Source: Audit Commission Portfolio 2002, England and Wales – excludes day surgery units and obstetric units

- 8 This review is one of the most comprehensive assessments of NHS operating theatres since the 1989 Bevan report (**Ref. 3**). Statistics on numbers of scheduled theatre sessions, and numbers of cases done within and outside them, stopped being collected in England and Wales in the mid-1990s. The Department of Health (DoH) and the Welsh Assembly Government now collect data from all hospitals on numbers and types of operations performed, and cancelled operations. These data give no information about a key resource in theatres: time. An Audit Commission bulletin on operating theatres in May 2002 (**Ref. 4**) gave a summary of local audit findings in 70 NHS trusts in the preceding three years, which reported the use of theatre time. The present review provides a more comprehensive picture (**Box A, overleaf**) and is one of four national reviews being published at the same time. The other three cover outpatients, bed management, and waiting for elective admission. Data were collected on all these topics during 2002 or for the financial year 2001/02 from almost all acute and multi-service NHS trusts in England and Wales as part of the Acute Hospital Portfolio Project (see back cover for more details).

Box A

Summary of the approach for operating theatres

Key features of the approach include the following:

- It covers 202 NHS acute and multi-service trusts in England and Wales (305 theatre units).
- It excludes theatre units used exclusively for day surgery (because these were reviewed separately by the Audit Commission in 2000) or for obstetrics.
- Activity and staffing data were collected in a sample period of six weeks in spring 2002 (6 May to 16 June in most trusts) amounting to a total of 317,000 patient operating hours or an average of 1,585 hours per trust. Other data related mainly to the financial year 2001/02.
- All data were checked by auditors, and the Audit Commission and trusts have corrected data in response to queries.
- Data collected for a similar sample period in the other Audit Commission reviews enabled associations between theatre performance, bed availability and waits for admission to be investigated.
- The approach was designed in consultation with the NHS Modernisation Agency in England and Innovations in Care in Wales to ensure that the Audit Commission's data and analyses complemented their theatre programmes. There are a few differences in the indicators, to reflect the needs of the different programmes (**Ref. 5**).

Source: Audit Commission

- 9 The Government's plan for progressively reducing waiting times implies that operating theatres need to increase throughput. This review is structured around the question of whether trusts can absorb the extra work within their existing resources. Key resources are theatre time (and the associated time of anaesthetists, surgeons, theatre staff and others) and physical theatre space.
- 10 The review starts by considering the use of the 84 per cent or so of theatre time that is scheduled (covering 85 per cent of patients). How much of the time is actually used for operations? This is particularly important for elective surgery, where high levels of use ought to be achievable.
- 11 If the use of sessions is high, but lack of theatre capacity is still creating a bottleneck within the wider system, the scheduling of the physical theatre space must be critically examined. Reorganisation to increase the number or length of scheduled sessions may be possible, failing which new theatres will probably be needed as a last resort. Physical space problems may affect only a few trusts at present, but this issue could become more important if theatre workloads continue to grow.

- 12 Lastly, the review considers the efficient provision of staff and equipment, and the quality of management arrangements and performance information.
- 13 No universal terminology exists to describe the work of operating theatres, but the use of special words and phrases is unavoidable. We recommend that readers refer to the glossary in the Appendix if in doubt. The review is written primarily for trust managers of theatres but is also intended to be accessible to the public.

Efficient use of scheduled theatre time

Theatre managers should monitor the actual use of scheduled operating hours

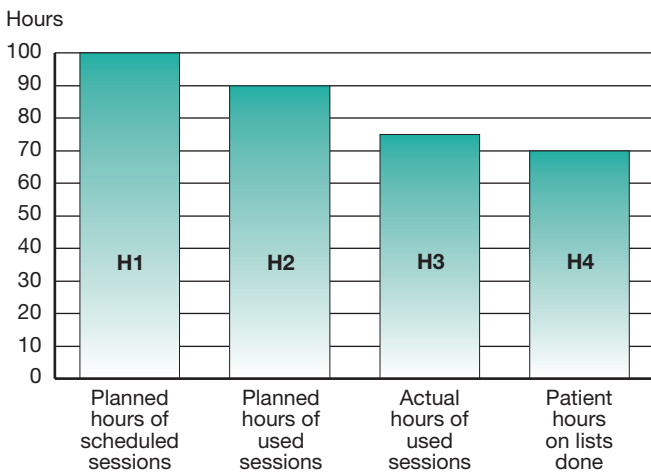
- 14 Many operations are planned days or weeks in advance of the operating date. Theatre units have timetables that show all the scheduled sessions of all doctors that use the theatres, so it is possible several weeks in advance to know that consultant X has a scheduled session on, say, Tuesday the 15th in theatre six starting at 09:00 and finishing at 12:30. Every timetabled session has allocated to it the anaesthetists, surgeons and theatre staff needed to undertake the work.
- 15 Because waiting lists are generally long and hospital resources are scarce, consultants are expected to make full use of their scheduled operating hours. They therefore have to select patients so that the actual operating time matches the scheduled time for the session. This is not easy because the amount of time it takes to perform even the same operation varies depending on the exact pathology found during surgery and on the characteristics of individual patients. Theatre managers should monitor the actual use of scheduled operating hours to check that the allocated resources are being adequately used and are matched to current demands.
- 16 The degree of control that doctors have when planning lists varies from very high for elective lists, through medium for trauma lists, to medium/low for emergency lists. Therefore the use of scheduled hours should be highest for elective lists and lowest for emergency lists, with trauma lists in between.

Measurement of use of scheduled theatre time

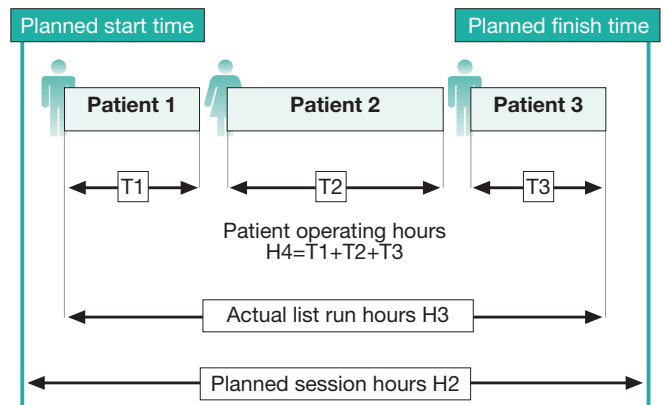
- 17 Measurement and analysis of scheduled time vary considerably among trusts, and even between different theatre units in the same trust. The approach used in this review is shown in **Box B, overleaf**.

Box B Measures of utilisation of scheduled theatre time

Chart showing key data needed to monitor utilisation.



Schematic diagram of a scheduled and used theatre session. Individual patient hours include anaesthetic and surgical time – see Appendix: glossary of terms.



Indicator	Calculation (see chart)	What it represents
Planned hours of sessions used, as a percentage of planned hours of planned sessions	$100 H2 / H1$	Difference between 100 and the indicator represents hours lost because of cancelled sessions
Actual run time of lists as a percentage of their session planned hours	$100 H3 / H2$	Difference between 100 and the indicator represents hours lost because of list underruns. An indicator greater than 100 shows list overruns
Patient operation hours as a percentage of anaesthetic and surgical hours	$100 H4 / H3$	Difference between 100 and the indicator represents hours lost because of gaps between patients on a list
End utilisation of the original planned hours	$100 H4 / H1$	The proportion of the original planned hours that was used for operating

Note: The timing points used to calculate the various sets of hours should preferably be those given in Box D (page 32) and in the Glossary, but the Audit Commission allowed trusts to select the nearest equivalents if they did not record the preferred ones.

Source: Audit Commission

- 18 It is useful to consider what time loss is acceptable for each of the three factors, and so determine a reasonable expectation for the 'end utilisation of the original planned hours'.

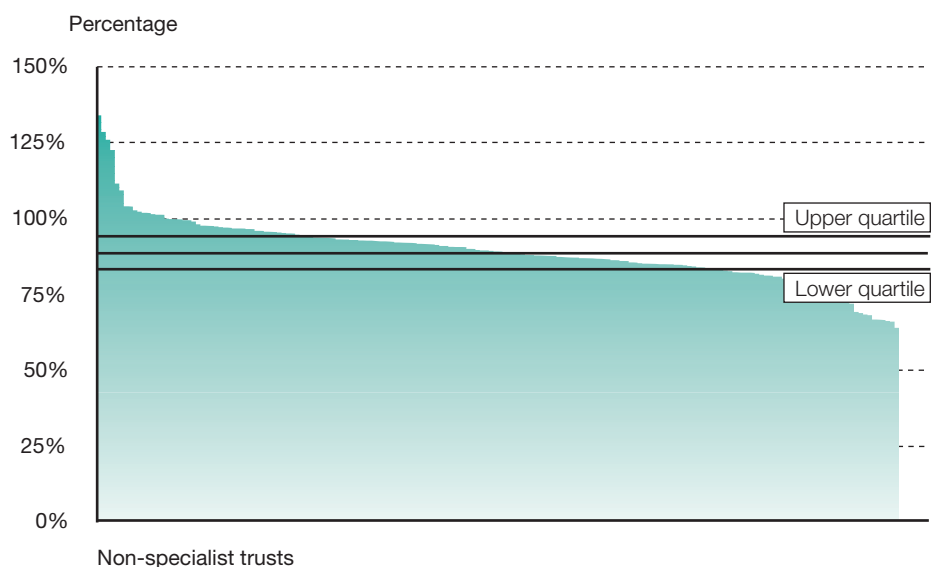
Cancelled lists

- 19 Cancelled lists result in fewer hours than planned being available in theatre. Nationally, for every 100 hours of scheduled sessions, an average of nine hours are not used because of lists being cancelled (**Exhibit 2**).
- 20 Data on planned sessions and hours were provided by theatre units in the form of their theatre timetables for the sample period. These had to reflect sessions scheduled before adjustment for annual leave of surgeons and anaesthetists and any other reasons that may result in sessions being cancelled. However, bank holidays were excluded. The difference between these sessions and the ones actually used, in terms of their planned hours, shows the planned time lost due to cancelled sessions. The losses exclude sessions that were cancelled by one surgeon but subsequently used by another. In other words, the cancellations are net of any swapping of sessions within or between specialties.

Exhibit 2

Planned hours of sessions used, as percentage of planned hours of planned sessions, for scheduled elective sessions

On average, the sessions that trusts actually use amount to 90 per cent of the sessions originally planned, the loss of 10 per cent being due to cancelled sessions.



Note: The indicator is measured in planned hours rather than numbers of sessions because sessions are not always planned to be the same length of time. For definition of 'non-specialist trust' see Appendix: glossary of terms.

Source: Audit Commission Survey 2002, England and Wales

...it is good practice for theatre units to have a system for identifying sessions that are at risk of cancellation several weeks in advance

21 The reasons for list cancellation were not collected but evidence from other sources suggests the most common reasons may have been:

- lack of ward beds; and
- the surgeon or anaesthetist not being available.

Evidence on the link between ward bed availability and cancellation of entire lists is inconclusive and more research is needed.

22 Surgeons and anaesthetists are expected to be available for only about 85 per cent of the time, because of annual leave (six weeks) and continuing medical education (two weeks). It was once a common practice for junior doctors to take over lists when consultants were on leave, but there is much less scope for this now under the training and supervision regulations laid down and monitored by the Royal Colleges. However, it is good practice for theatre units to have a system for identifying sessions that are at risk of cancellation several weeks in advance so that they can be offered to other consultants. Large trusts can more easily find alternative surgeons in the same specialty; other trusts have to offer cancelled sessions to a different specialty. Doctors' leave allowances average 15 per cent of their time, yet the median cancellation rate is only 9 per cent, suggesting that most trusts have made some effort to anticipate cancellations due to annual and study leave.

23 A very small number of trusts report that their theatre timetables are designed to give an appropriate number of sessions for each specialty after allowing for the average availability of surgeons and anaesthetists. Their results may be higher on this indicator. Some trusts remove sessions that are affected by planned leave from their timetables many weeks ahead of the operation so that other staff and patients are not committed to these sessions. In other words, they may believe that a low performance on this indicator does not represent wasted resources. This may be true but only as long as every effort has been made to offer these sessions to other consultants before deciding to remove them.

24 Variation in performance across trusts is due not only to differences in the level of unplanned cancellations of sessions but also to differences in how trusts manage the planned leave of doctors. Since 50 per cent of trusts use more than 90 per cent of their planned sessions and 50 per cent of these use 95 per cent or more, a suggested target for this measure of theatre time is 92.5 per cent, which falls between these two.

Underrunning and overrunning lists

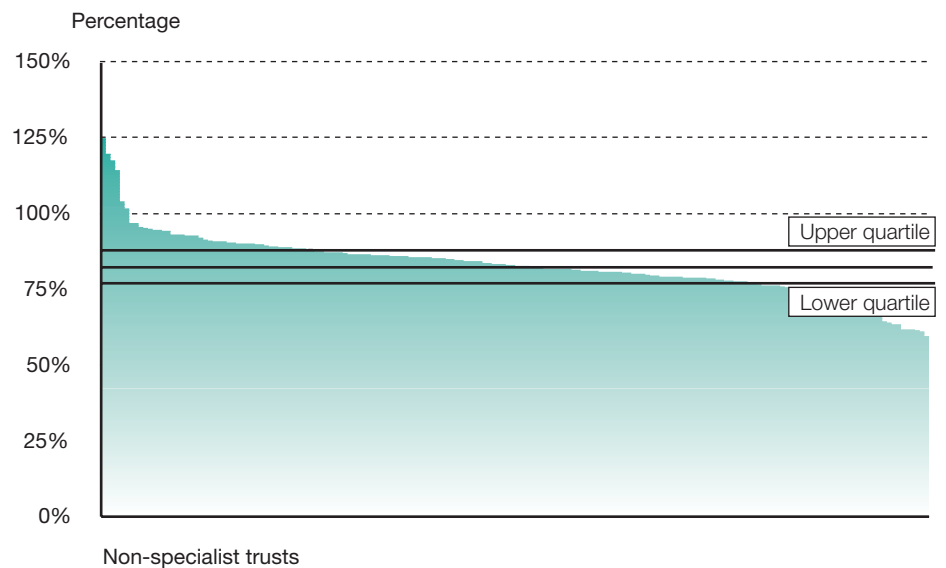
25 The run time is the time elapsed from the start of the first operation to the end of the last operation on a list. Actual run time of lists as a percentage of their session planned hours has a national median of 89 per cent and an upper quartile of 94 per cent (**Exhibit 3**). It is not reasonable to expect 100 per cent performance because it is impossible to predict perfectly how long operations will take. Surgeons have to avoid overrunning their lists because of the adverse effect on subsequent lists or on theatre staff overtime costs. They understandably err on the side of

under-booking. The Bevan report (Ref. 3) suggested a standard of 90 per cent although it was not precise about how this should be measured.

Exhibit 3

Actual run time of lists as percentage of their session planned hours, for scheduled elective sessions

In the average trust, lists run for 89 per cent of the planned hours of the sessions they use. Many trusts achieve less than this but a few trusts have a result greater than 100 per cent, meaning that most of their lists overrun the planned hours.



Source: Audit Commission Survey 2002, England and Wales

26 Lists underrun either because they start late (perhaps because previous commitments take longer than expected) with few chances to catch up by finishing late, or because the list has insufficient patient operating time on it and finishes early. The main reasons for inadequately filling sessions are:

- persistent bottlenecks elsewhere in the hospital (for example, a lack of intensive care beds or general ward beds) that were not foreseen when the list was planned;
- operations being cancelled because patients were not assessed adequately beforehand or because patients have cancelled or not turned up at the hospital; and
- theatre timetables not being updated to reflect changes in workloads (casemix or specialty).

In some trusts there are specialties that regularly over-run their allotted theatre time.

- 27 Some trusts identify patients who are willing to have their operation at very short notice, in order to replace others who have cancelled, but last minute cancellations cannot be replaced in this way.
- 28 In some trusts there are specialties that regularly overrun their allotted theatre time. This may be because of a mismatch of supply and demand – the specialty has been allocated too little theatre time for the number of operations required to keep on top of waiting lists. It can also occur because too many lists have been cancelled and the specialties then attempt to catch up by over-booking when they do run lists.
- 29 A list that has a mix of minor, intermediate and major cases on it can be planned to make full use of a session more easily than a list with only one or two major cases. Surgeons sometimes say that the creation of dedicated daycase units has reduced the numbers of minor cases on inpatient theatre lists, making it harder to achieve use of theatre time. However, the national average results by specialty show that specialties with more cases per list on average, such as ear, nose and throat (ENT), oral surgery and ophthalmology, have some of the lowest use of theatre time in the sessions they use. Longer sessions might be thought to offer more scope to fit operations more tightly into the planned hours, but again the data do not support this. Ideally, trusts should adapt the length of sessions to suit the casemix. Many trusts have moved away from ‘one size fits all’ – only 60 per cent of all sessions have a planned length of the traditional three and a half hours – but it is not known whether this has been driven by casemix or other considerations.
- 30 The addition of emergency operations to elective lists is said to increase the incidence of underruns (because the emergency slots on the list are not always needed), but the data do not support this view either.
- 31 In the absence of evidence of factors that might make this measure of the use of theatre time harder or easier to achieve, it seems reasonable to suggest that Bevan’s target of 90 per cent remains suitable as a target for today.

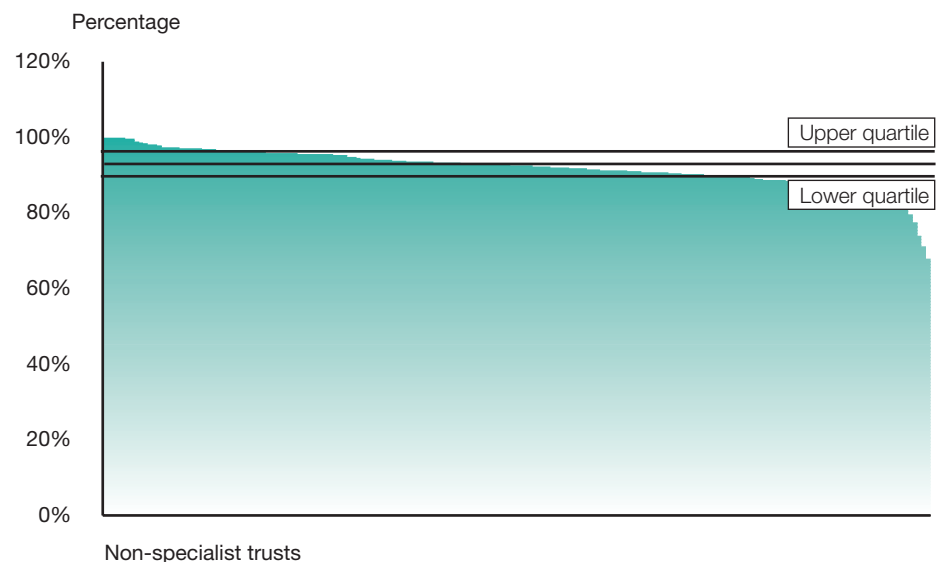
Gaps between patients

- 32 In an ideal world, once a list has started, each patient would be anaesthetised just as the previous patient was leaving for recovery. In practice this is hardly ever achieved, so patient operating hours (the total of the anaesthetic and surgical times) as a percentage of the available anaesthetic and surgical time has a national median of 92 per cent and an upper quartile of 96 per cent (**Exhibit 4**). This measure focuses on the parts of the patient’s pathway through theatres when anaesthetists and surgeons are most involved and, in essence, shows how much of their available time is actually used for patients.
- 33 Reducing gaps between patients requires sufficient numbers of medical and theatre staff. For lists that are assigned only one anaesthetist it is normal for there to be a short interval as the anaesthetist hands over care of one patient to the recovery sister and then returns to the anaesthetic room to start anaesthetising the next.

Exhibit 4

Patient operation hours as percentage of anaesthetic and surgical hours, for scheduled elective sessions

The average trust uses 92.5 per cent of the available anaesthetic and surgical time for operations on patients. The other 7.5 per cent is lost due to gaps between patients on the lists. Some trusts lose much more than the average, due to longer or more frequently occurring gaps.



Note: The indicator is calculated so that the maximum possible value is 100 per cent.

Source: Audit Commission Survey 2002, England and Wales

- 34 Other potential causes of these gaps include late changes in the order of patients on a list, inadequate pre-operative preparation, delays in getting patients from wards to theatres (caused, for example, by problems with the lifts) and failures in the supply of equipment and surgical instruments.
- 35 Lists with many patients on them might be expected to have more total gap time than lists with only a few. Despite this logic, there is no apparent link between this utilisation measure and the average number of cases per elective list. It may be that units tend to increase staffing for high throughput lists in order to maintain patient flow.
- 36 If the median result of 92 per cent is applied to a typical list of three and a half hours duration with three or four cases on it, the average gap between patients would be 8.4 or 5.6 minutes respectively, which does not seem unreasonable long. The figure is therefore suggested as a national target for this measure of the use of theatre time.

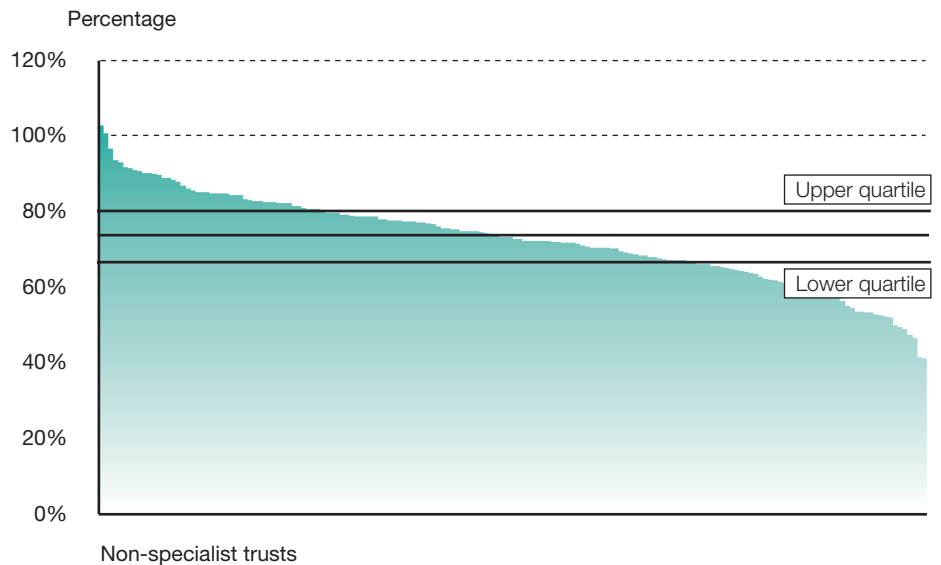
End utilisation

37 The combination of whole lists being cancelled, of list underruns and of gaps between patients means that, of the total operating hours provided in scheduled sessions, on average only 73 per cent are actually used for operating. This is the so-called end utilisation (see Box B, page 6, for definition). This national average performance compares quite favourably with the target implied by combining the targets for the three factors just suggested of 92.5 per cent x 90 per cent x 92 per cent = 77 per cent. However, performance varies considerably between trusts, with a range from 41 per cent to 103 per cent (**Exhibit 5**). Clearly the trusts with the lower 'end utilisations' should examine the reasons behind this and either increase their work throughput or reduce capacity. And trusts with an 'end utilisation' above 100 per cent should consider increasing capacity.

Exhibit 5

End utilisation of original planned hours for scheduled elective sessions

The average trust uses 73 per cent of the planned session hours in the original timetable, the losses being due to cancelled lists, underruns and gaps between patients. Many trusts achieve less than this but a few trusts have a result greater than 100 per cent, the gains being due to carrying out more lists than planned or to overruns.



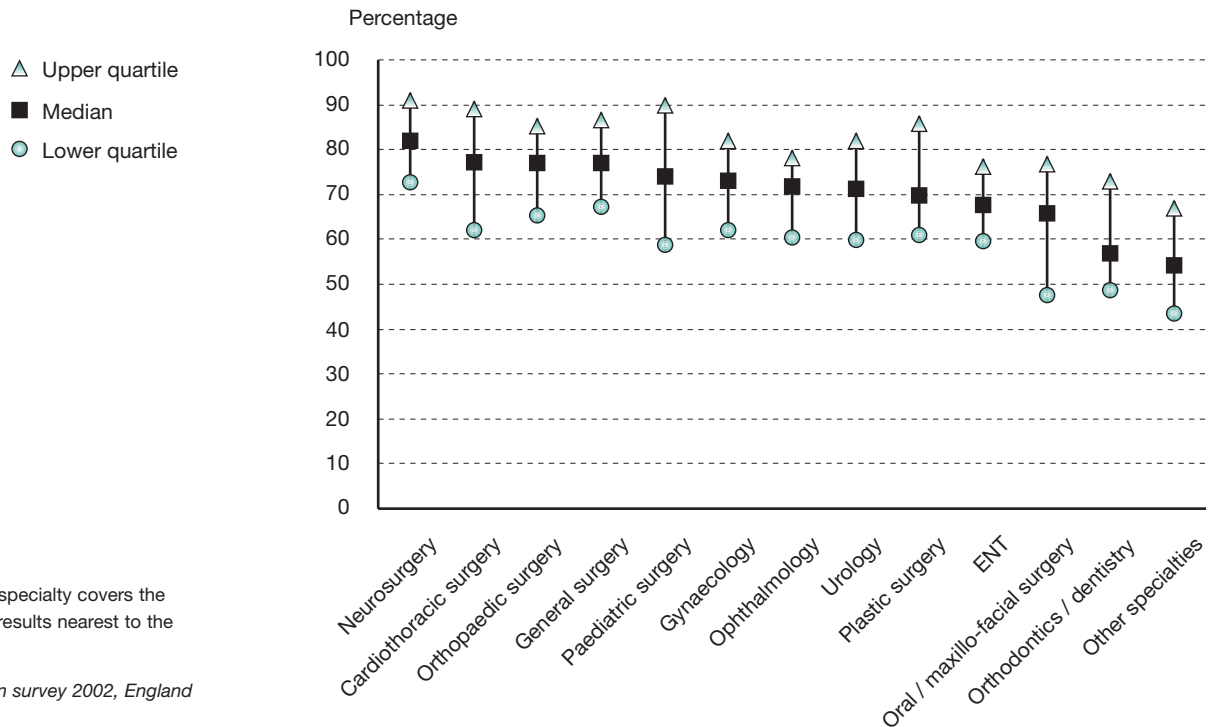
Source: Audit Commission Survey 2002, England and Wales

38 It is reasonable to expect different levels of performance from different specialties, but the evidence in this review shows that the range of performance for any specialty has a considerable overlap with that of most other specialties (**Exhibit 6**). We have therefore not suggested specialty-specific target performances.

Exhibit 6

End utilisation of original planned hours, by specialty

The highest average end utilisation was achieved by neurosurgery and the lowest by 'Other specialties', but the specialty ranges overlap considerably.



Note: The range for each specialty covers the 50 per cent of trusts with results nearest to the average.

Source: Audit Commission survey 2002, England and Wales

39 The discussion so far has been about elective surgery. Trauma and emergency work in scheduled sessions is less easy to plan and so expectations are lower. **Exhibit 7, overleaf**, summarises observed performance and gives suggested targets for the various indicators discussed in this section, for each of the three types of scheduled list. The targets for trauma and emergency sessions are arbitrary, but are heavily influenced by the range of current performance. Overall, trauma lists perform as well as elective lists; although their sessions are more likely to underrun, this is compensated for by the fact that they are less likely to be cancelled in the first place.

Exhibit 7

Summary of trusts' use of scheduled theatre time and suggested targets

Trusts whose performance is below the suggested targets should examine why this is the case, and either increase their work throughput or reduce capacity.

Type of scheduled list	Planned hours of sessions used as percentage of planned hours of planned sessions		Actual run hours of lists as percentage of their session planned hours		Patient operation hours as percentage of anaesthetic and surgical hours		End utilisation of original planned hours	
	National interquartile range	Suggested target	National interquartile range	Suggested target	National interquartile range	Suggested target	National interquartile range	Suggested target
Elective	83.0-95.5	92.5	83.5-94.1	90.0	89.8-95.7	92	65.6-80.8	77.0
Trauma	85.4-101.0	95.0	76.6-97.0	88.0	86.5-95.9	92	58.9-86.4	77.0
Emergency							38.4-62.7	60.0

Note: Only one utilisation measure is available for scheduled emergency lists.

Source: Audit Commission Survey 2002, England and Wales

Potential for carrying out more elective operations

40 The Government's tough targets for admission waiting times over the next two years mean that most trusts need to find ways of undertaking more elective operations within their existing resources. The suggested end utilisation performance target of 77 per cent for elective lists is useful in planning how to respond to these pressures. A first step might be to adopt the following rules:

- planned elective sessions of specialties performing below the end utilisation target should absorb extra cases within their existing timetabled hours; and
- planned elective sessions of specialties whose end utilisations exceed 100 per cent are overstretched. The solution is to reduce the average number of cases being done in each session to bring their end utilisations at least down to 100 per cent (and then consider options for increasing the number of available sessions).

An analysis of the potential gains or losses of cases that would result from adopting these rules indicates that most trusts could do more cases within their existing theatre timetable, with the addition of only a few extra costs (**Exhibit 8**).

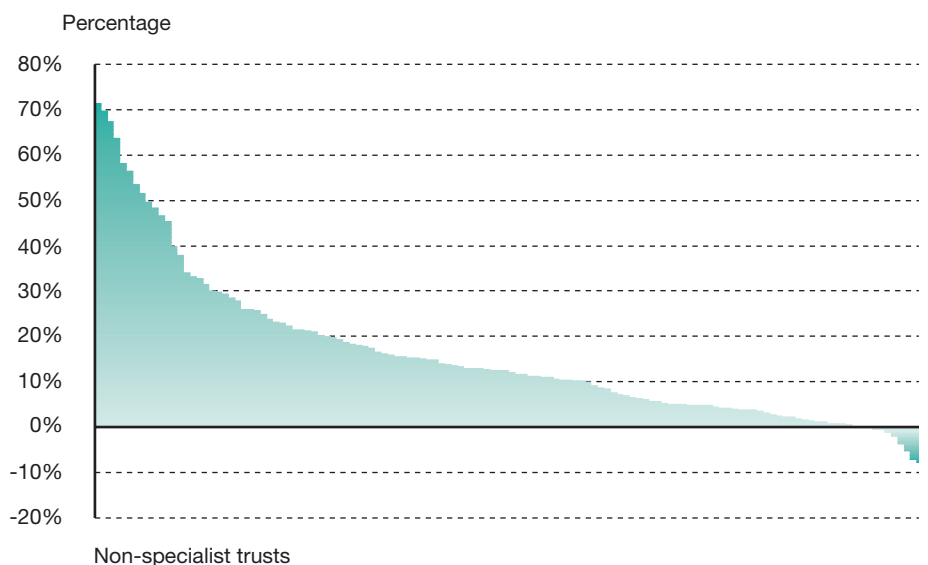
41 A problem with the first step of the analysis, summarised in Exhibit 8, might be that the adjusted caseloads do not necessarily match the demands of each specialty. Even so, the size of the potential indicates that at the very least that there are mismatches between session time and current specialty caseload in most trusts. It is vital that trusts review their use of existing scheduled elective sessions. Such analysis will raise many practical questions, such as:

- Can each under-utilising specialty admit cases from the waiting list faster than at present (is there sufficient demand?), or should it give up some theatre sessions?
- Can any over-stretched specialty use extra theatre sessions given up by other specialties or must extra sessions be added to the theatre timetable and extra theatre resources provided for them?

Exhibit 8

Potential growth or reduction in number of cases if all specialties and trusts had an end utilisation of between 77 and 100 per cent

The majority of trusts have some specialties with end utilisations below 77 per cent, and these could carry out more operations in their existing sessions.



Note: The results are based on applying the suggested end-utilisation range of 77 per cent to 100 per cent to every specialty in each trust. Specialties with results below this range could do more cases if they increased utilisation to 77 per cent, or they would need to do fewer cases to bring their utilisation down to 100 per cent, as appropriate. The net total potential change in cases for each trust is shown as a percentage of the number of cases that were actually done on all the elective lists.

Source: Audit Commission Survey 2002, England and Wales

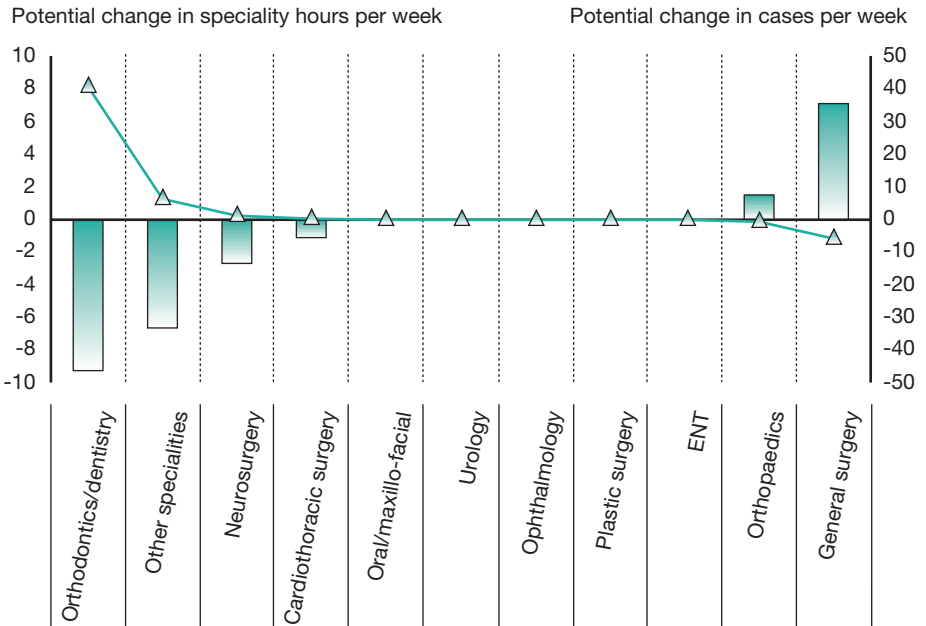
42 All these changes need to be considered across the specialties of a single trust using analysis similar to that shown in **Box C, overleaf**. The potential benefits of any proposed improvements in efficiency are unlikely to be achieved unless trusts not only identify the causes of inefficiency, but also require specialties to achieve the higher caseloads or implement the re-allocation of sessions or both, depending on the conclusions of their efficiency reviews.

Box C

Illustration of potential changes in one trust to improve use of theatre time

Orthopaedics and general surgery are over-stretched and need, respectively, one and two extra scheduled sessions each week (assuming three and a half hour sessions) to do their existing caseload. Alternatively they should reduce their caseload. Assuming reducing caseload is not acceptable, the extra sessions might be found from orthodontics and other specialties, as they could each release two and one sessions respectively and maintain their existing caseload. However, if orthodontics or other specialties have long waiting lists they can and should use their existing sessions to do extra operations each week. In that case orthopaedics and general surgery could either remain over-stretched or the extra sessions would need to be funded and added to the theatre timetable, and they may need even more sessions if their waiting lists are long.

The illustration also shows that neurosurgery could carry out more cases during its existing sessions.



Potential change in planned hours per week if caseload remains constant	-9.3	-6.7	-2.7	-1.1	0.0	0.0	0.0	0.0	0.0	1.5	7.1
Potential change in cases per week if planned sessions remain constant	40.7	6.2	1.0	0.2	0.0	0.0	0.0	0.0	0.0	-0.8	-5.8

Source: Audit Commission Survey 2002, England and Wales. One selected trust analysed to show the possible changes if each speciality achieved an end utilisation that is no lower than 77 per cent and no higher than 100 per cent

- 43 In some trusts those specialties that need more theatre time may be unable to use sessions given up by others because they lack some other key resources, such as medical staff. In other trusts, the sessions given up by under-utilising specialties may be insufficient to solve the problem of over-stretched specialties. Extra sessions may be needed in the theatre timetable. In the worst possible case this may mean that extra theatres are needed.
- 44 Even then, other constraints, such as insufficient available beds, may prevent trusts from achieving all the potential extra throughput, although the Audit Commission data did not show a significant relationship between surgical bed occupancy and this potential.

Use of existing theatre space

- 45 Trusts that need more theatre capacity, whether to reduce waiting lists or to handle emergencies more effectively, should start by examining their use of scheduled sessions, as outlined in the last section. Once they are satisfied that the currently scheduled sessions are being used fully and efficiently, the next consideration will be whether to schedule more or longer sessions and, if so, where and when these can be fitted in. It is helpful to look at how trusts have responded to these questions and to consider national information on average workload per theatre, on variations in this workload during the week, and on special considerations that affect the timing of operations during the 24-hour day or that determine that an operation must be done in a particular theatre.
- 46 The discussion focuses on theatre units (rather than trusts), as physical constraints are involved. A theatre unit is a set of theatre facilities, staff and other resources that provides a self-contained theatre service under one management. Many trusts have several such units.

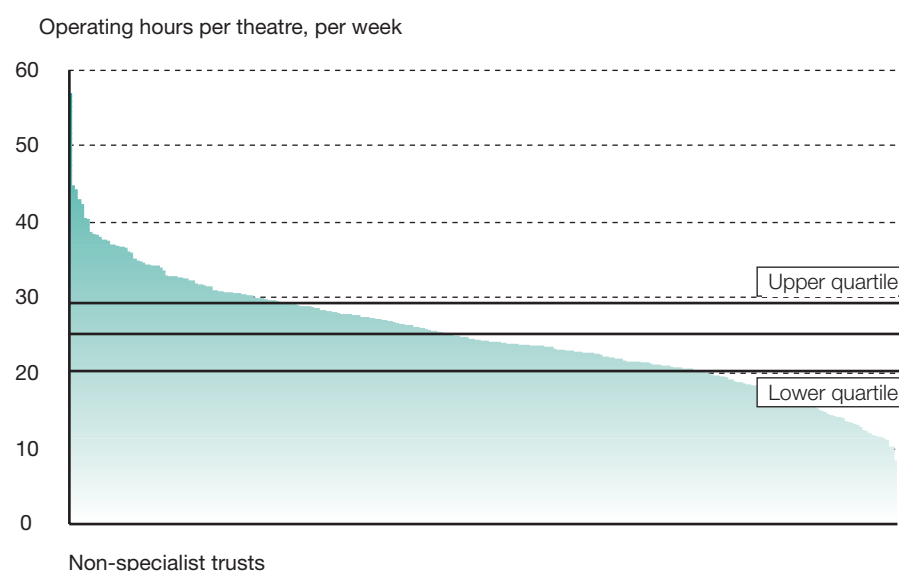
Average operating hours per available theatre

- 47 Theatres are physically available for use 24 hours a day, seven days a week, but the main periods of use are determined by when doctors, theatre staff and other staff are available to do the work. In practice most theatres achieve two scheduled sessions per day (usually of three and a half hours each) on weekdays, together with a number of unscheduled (usually emergency) operations. So, for example, a well-used theatre unit of seven theatres might have two scheduled lists every weekday in every theatre and the unit as a whole might handle six hours a day of emergency work, giving an average workload of 41 hours per theatre per week. Data collected by the Audit Commission shows that actual workload varies between 8.3 and 57.0 hours per theatre per week, with a median value of 24.3 (**Exhibit 9, overleaf**).

Exhibit 9

Total actual operating hours per commissioned theatre per week

A well-used theatre unit would average more than 40 hours use per theatre per week, but very few units are actually this busy, and the average unit does 24 hours' work per theatre per week.



Note: Total actual operating hours covers all operations regardless of the type of patient, the type of list and the time of the day or week, and the hours are calculated from the start of anaesthetic to leaving the operating room (or nearest timing points).

Source: Audit Commission Survey 2002, England and Wales

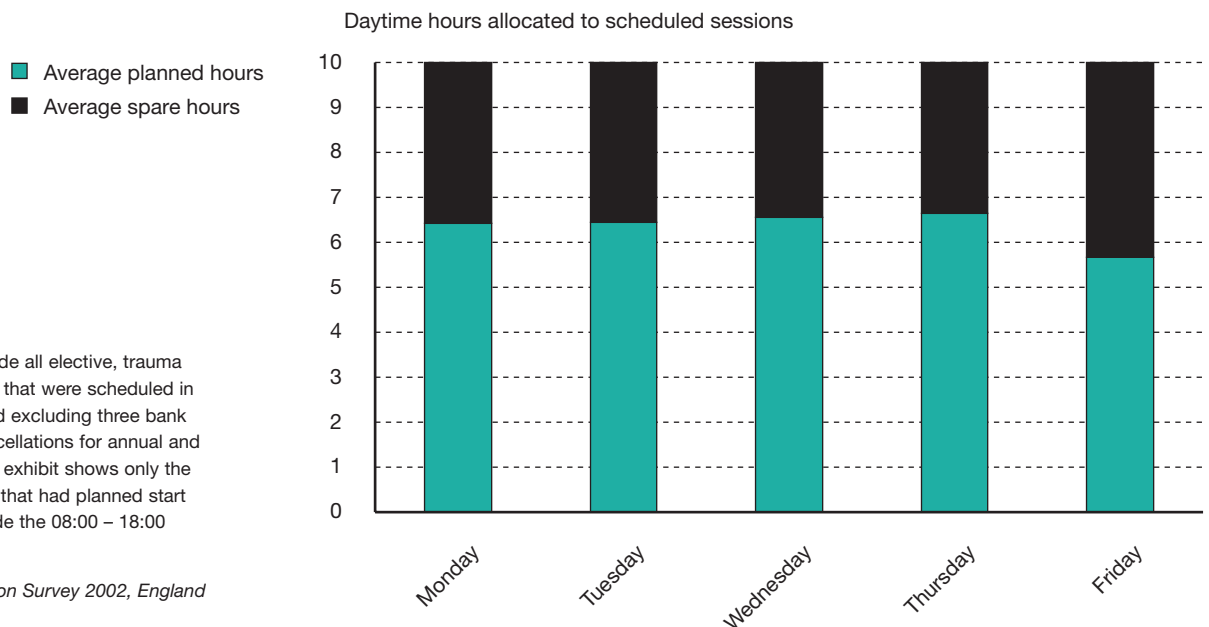
- 48 These figures imply that most theatres are scheduled to be used for only a fraction of the time potentially available. On the other hand it is known that some trusts are experiencing theatre capacity problems. Explanations of this apparent paradox include:
- variation in workload;
 - the management of emergency operating risks through the use of daytime scheduled sessions; and
 - specialised theatres.

Variation in workload

- 49 Around 85 per cent of total operating is accounted for by operations on scheduled lists. The daily pattern of this part of the workload is therefore controlled by trusts and they should aim to schedule the work evenly over the days of the week. Analysis of the pattern of work on weekdays between 08:00 and 18:00 (the busiest time of the day) shows a fairly even pattern of planned hours for scheduled sessions, but Fridays have about 15 per cent fewer hours (**Exhibit 10**).

Exhibit 10**Average scheduled operating hours per theatre from 08:00 to 18:00, by weekday**

Scheduled sessions are fairly evenly spread over the weekdays in the busiest period of the day, with a peak on Thursdays and a trough on Fridays. Less than 70 per cent of this busiest period is planned to be used in the average theatre unit.



Note: The sessions include all elective, trauma and emergency sessions that were scheduled in a six-week sample period excluding three bank holidays but prior to cancellations for annual and other types of leave. The exhibit shows only the relevant part of sessions that had planned start times or end times outside the 08:00 – 18:00 period.

Source: Audit Commission Survey 2002, England and Wales

- 50 There are several explanations for the 15 per cent lower workload on Fridays (including multi-professional and multi-specialty meetings or reductions of post-operative ward cover at weekends that might restrict Friday operating) but these are only anecdotal.
- 51 The material conclusion from Exhibit 10 is that scheduled sessions account for less than 70 per cent of the available weekday hours between 08:00 and 18:00.
- 52 A similar analysis exclusively for elective sessions shows that only 1 per cent of the total planned hours for elective sessions were scheduled for weekends and only 16 per cent of theatre units used any theatres at the weekends for elective lists during the sampled period (May – June 2002).

...if too much time has been scheduled for trauma and emergency cases in the daytime, it can generate a spurious case for building more theatres

- 53 Trusts that have maximised their use of theatre time and are still short of scheduled theatre sessions should, as part of their option appraisals consider using theatres more intensively on weekdays, running into the early evening if possible, and then perhaps establishing further sessions at the weekend. Most trusts would need to change contracts of employment in order to have staff on duty at these times without incurring overtime costs, and they would need to employ more staff to cover the increased operating hours. Other services elsewhere in the hospital, such as pathology and pharmacy, would also need to extend their hours, and staffing levels on wards would need to be increased at these times. The increases in NHS funding and the introduction of new types of staff contracts offer some hope that such changes are becoming more feasible as an alternative to capital investments.

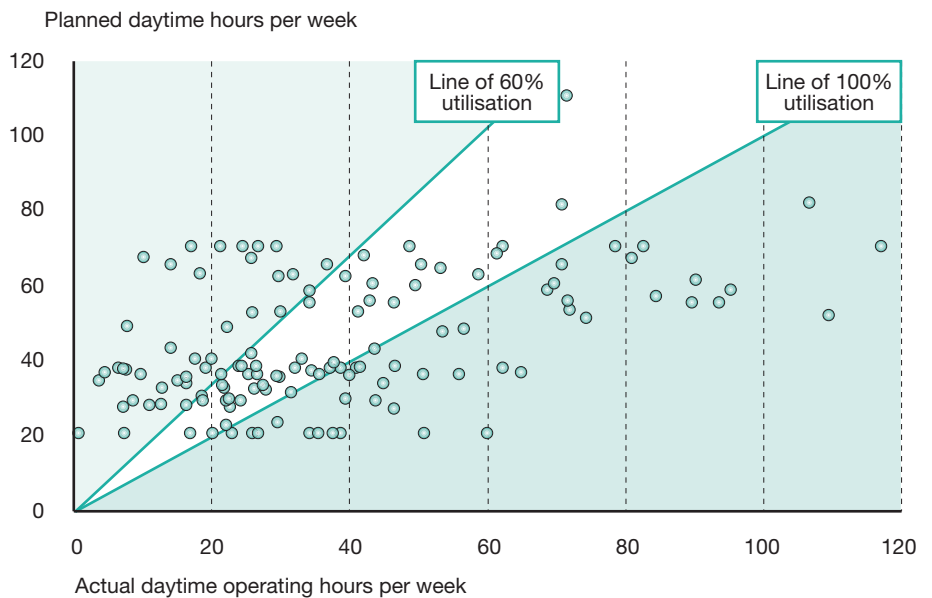
Daytime scheduled sessions for trauma and other emergency operations

- 54 Night-time operating has long been recognised as carrying greater risk. The National Confidential Enquiry into Perioperative Deaths (NCEPOD) has issued several reports that demonstrate that there is a higher risk of perioperative death if patients are operated on at night. This is thought to be because it is less likely that a consultant anaesthetist or consultant surgeon will be present. Based on a review of perioperative deaths, NCEPOD's precursor advised that very few operations are clinically urgent enough to have to be performed at night (**Ref. 6**). Some of the operations being done at night were delayed from the previous day because the theatre schedule was too busy; some other operations were being done by inexperienced doctors when ideally they should be done the following day when experienced doctors are on hand. Further NCEPOD reports (**Ref. 7**) recommended that dedicated operating rooms should be available for emergency surgery. This was endorsed by the DoH (**Ref. 8**). While some trusts introduced one or more dedicated theatres, the more common practice was to introduce dedicated daytime sessions into the theatre timetable. By 1997 The Royal College of Surgeons of England (**Ref. 9**) was advocating further centralisation of emergency surgical services in order to serve larger populations and to make it feasible to have a 24-hours-a-day theatre dedicated to emergency operations and a consultant-based emergency service.
- 55 Some trusts that are trying to carry out the NCEPOD recommendations may find it difficult to provide enough scheduled emergency sessions in the weekday theatre timetable during the daytime, because scheduled elective sessions are competing for the same space. This may form a good case for building more theatres. However, if too much time has been scheduled for trauma and emergency cases in the daytime, it can generate a spurious case for building more theatres to provide extra capacity for elective operations (**Exhibit 11**).

Exhibit 11

Daytime emergency and trauma operating – planned session hours in relation to total actual operating hours

Trusts above the 60 per cent utilisation line have too many scheduled sessions. Trusts below the 100 per cent utilisation line do not have enough scheduled hours and may have a genuine case for introducing more scheduled sessions. Trusts between these two lines have scheduled approximately the right number of hours.



Note: Both axes refer to the busiest period of the day, 08:00 – 18:00. Actual operating hours were estimated from total hours (all times of the day) and the known proportion of emergency and trauma cases occurring between 08:00 and 18:00. The 60 per cent utilisation line is the suggested target given in Exhibit 7.

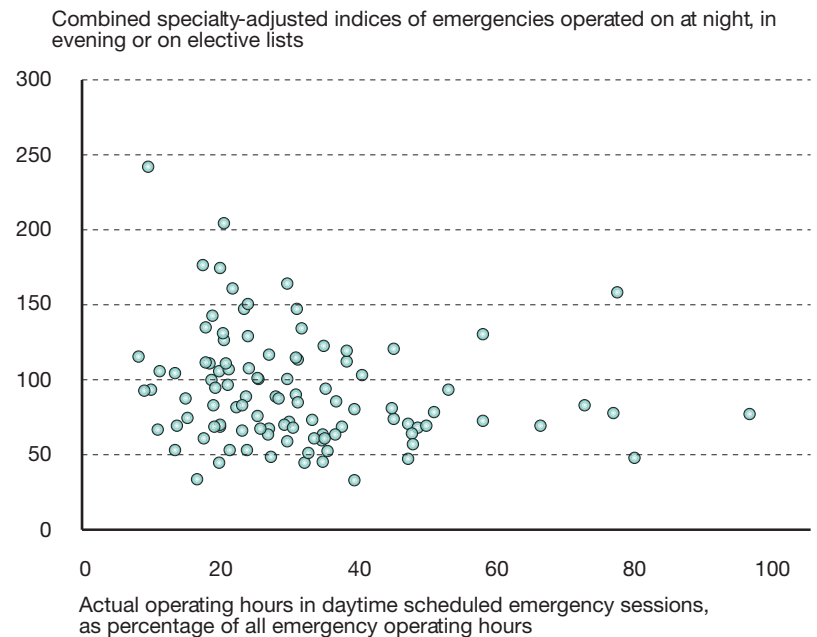
Source: Audit Commission Survey 2002, England and Wales

- 56 It is clear from these data that provision of scheduled sessions for trauma and emergency cases could increase the number of theatres required if the total required daytime sessions cannot be fitted into the existing theatres. However, how effective such lists are in achieving their objectives needs to be included in planning reviews. On balance, trusts that use these lists do have lower amounts of out-of-hours operating on emergency or trauma cases and fewer emergency operations on elective lists (**Exhibit 12, overleaf**). But, the association is very weak. Use of scheduled emergency lists does not guarantee that emergencies are handled effectively and individual trusts should examine how they use their scheduled emergency and trauma lists.

Exhibit 12

Relationship between the use of daytime scheduled emergency sessions and the actual timing and placing of emergency operations

Units that do a higher proportion of emergency operating within daytime scheduled emergency sessions tend to perform relatively fewer emergency operations at night, in the evening or on elective lists, but the relationship is weak.



Note: A theatre unit with a combined index of more than the average of 100 does relatively more emergency operations at night or in the evening or on elective lists than other units that have the same mix of specialties.

Source: Audit Commission Survey 2002, England and Wales

- 57 One explanation could be that scheduled emergency lists are being used for elective surgery (some elective cases are occasionally unscheduled; more common are over-spills from elective lists being undertaken in other theatres). For example, on a sample of scheduled trauma lists (for which the theatre units concerned happened to make a clear distinction between emergency and elective cases), one-third of cases were elective, that is, 'cold' orthopaedic cases that would normally be done on scheduled elective lists.
- 58 Another explanation could be that the data collected for the review on emergency cases covers a range of degrees of urgency, from patients needing an operation within an hour through to others needing one within 24 hours. Operations that need to be done 'within the hour' will have been done at that time irrespective of whether a scheduled emergency operating list was available then. If trusts have different proportions of emergency cases that need to be done within an hour then this may explain some of the scatter in the results.

- 59 A common problem in running daytime scheduled emergency sessions is that the surgeons and anaesthetists that are allocated to do them may be called away to deal with emergencies elsewhere in the hospital. This is a factor in making efficient use of planned sessions and may help explain the results in Exhibit 12, as some operations that would have been carried out during these sessions may have been diverted to elective lists or delayed until the evening. The problem can be resolved by improving the level of hospital medical staffing emergency cover so that doctors who are allocated to scheduled emergency sessions are protected from being called away.
- 60 In summary, scheduled trauma and emergency lists are, in principle, necessary in many trusts in order to achieve the NCEPOD objectives for out-of-hours night-time operating. However, they do not appear to achieve these objectives reliably, and individual trusts need to do further work to understand why.

Specialised theatres

- 61 If one or more theatres in a theatre unit are reserved for certain types of operation, then the others may experience an unduly heavy general workload even though, overall, the unit appears to be adequately resourced. The main forms of specialisation are:
- single specialty;
 - 24-hour trauma theatre; and
 - 24-hour emergency theatre.

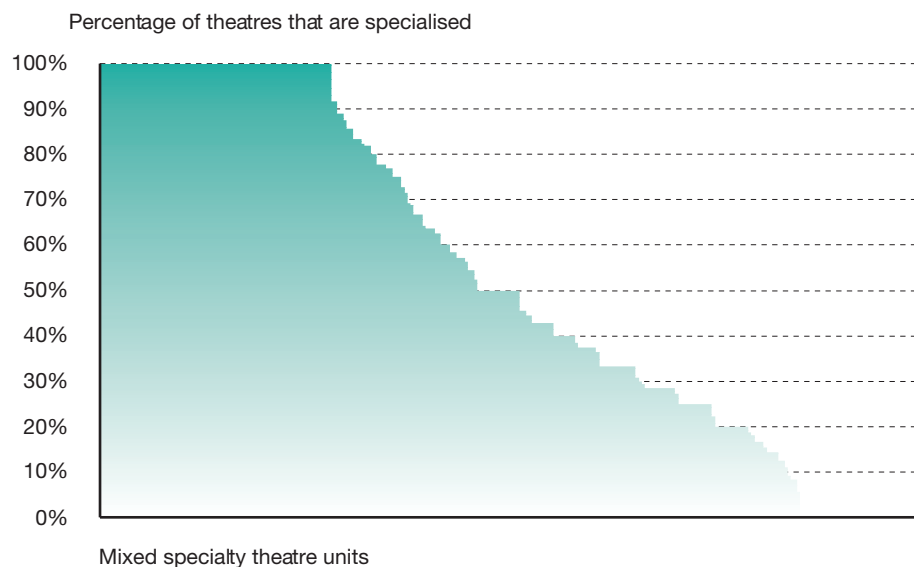
The typical unit has two or more of every five theatres dedicated for a specialised use and in 20 per cent of units every theatre has a specialised use (**Exhibit 13, overleaf**).

- 62 Two main reasons are commonly cited for specialisation of theatres:
- specialised equipment either cannot be moved or it is too expensive to provide it everywhere; and
 - prevention of cross-contamination.
- 63 However, the equipment argument should not preclude general use of a special theatre or even use by another specialty that has easily-moved equipment of its own. Some, perhaps many, trusts now provide one or more theatres that are specially designed for the extra clean requirements of orthopaedic or eye surgery, in order to reduce cross-contamination risks from other types of 'dirtier' surgery. However, policies for using these theatres differ: some trusts keep such theatres exclusively for the specialty; others allow other specialties to use them. The Hospital Infection Society Working Party has already published some clarification of the relative effectiveness of various infection control policies (**Ref. 10**). The role of special or dedicated theatre facilities in minimising infections is an unfinished part of the Working Party's remit which, potentially, could clarify the future need for specialised theatres.

Exhibit 13

Percentage of all theatres dedicated for a specific type of work

Twenty per cent of units dedicate all their theatres for specialised use; 15 per cent dedicate no theatres; the average unit dedicates 40 per cent of its theatres for specialised use.



Note: In a few units the specialised theatres include ones that are dedicated to daycase or obstetric operations but most trusts were able to exclude units dedicated for these types of cases, as asked.

Source: Audit Commission Survey 2002, England and Wales

- 64 Theatre specialisation could lead to pressure to build more theatres even though overall workload is not high. In such circumstances trusts should review the level of specialisation to see if it is really necessary.

Provision of other key theatre resources

Theatre staffing

- 65 The ability of theatre units to deal with the total workload depends on having not just sufficient physical capacity but also sufficient numbers of medical and theatre staff. In this review we focus on theatre staffing, which typically accounts for 50 per cent of total theatre unit costs.
- 66 Guidance for trusts on how to determine the theatre staffing requirements has been available from the National Association of Theatre Nurses (NATN) since 1995 (**Ref. 11**). It seems reasonable to expect some consistency across the country in the relationship between staffing provision and theatre operating hours. To investigate this, staffing and theatre activity data were included in the Audit Commission's returns for a sample period in 2002. The types of staff included were all those non-medical

staff who provide direct patient care within theatre units: operating department assistants (ODAs), operating department practitioners (ODPs), theatre nurses, recovery nurses and healthcare support workers who directly assist these staff.

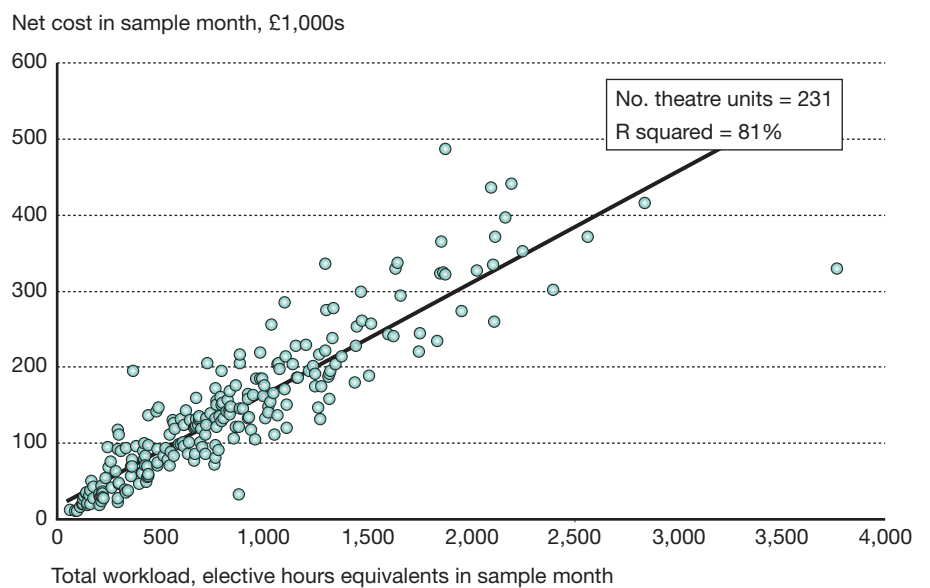
- 67 The net costs of theatre staff (gross costs adjusted for non-unit duties and for regional pay allowances) can be substantially (81 per cent) explained by the total numbers of operating hours for elective cases and emergency cases (**Exhibit 14**).
- 68 Although there is a strong relationship between staffing costs and hours, there is some difference between units with similar hours. Possible causes of this residual variation include:
 - the effect of vacant posts: overtime and use of bank and agency staff;
 - grade mix;
 - differences in staff productivity – some theatre units are under-staffed, while others are over-staffed for the work that they currently carry out;
 - the staffing model takes no account of specialty-mix; and
 - the data take no account of skilled staff acting as surgical assistants in a few units.

Exhibit 14

Theatre staffing costs and workload

There is a strong relationship between the predicted and actual staff costs of theatre units for a wide range of total operating hours.

● Observed cost
 — National average cost



Notes: The equation of the regression line is: national average net cost = 17,400 + 147 x total elective hours + 187 x total emergency hours, where 'emergency' also includes trauma cases. The horizontal axis presents total operating hours in 'elective hours equivalents'. Each emergency hour included in the total is valued at 187/147 of an elective hour in order to allow for the differing unit mixes of elective and emergency cases.

Source: Audit Commission Survey 2002, England and Wales

- 69 Vacant posts may reduce costs, or, if they are filled by more expensive bank and agency staff, may actually increase them. The data yielded the following details of vacancies and the related extra costs:
- Nationally, 10 per cent of funded theatre staffing posts were vacant in spring 2002. Only one in eleven trusts had all their funded posts filled, while one in five trusts had vacancies of 20 per cent or more.
 - Turnover rates were high: the median was 12 per cent and one-quarter of trusts exceeded 17 per cent.
 - On top of the problems caused by vacant posts, some trusts had to contend with high rates of sickness absence that further reduced availability - about a quarter of trusts had rates higher than 8 per cent.
 - Despite these widely occurring vacancies, budget outturns for 2001/02 show that the majority of trusts overspent their pay budgets and this was more likely if they made high use of bank and agency staff, which in one in four trusts accounted for more than 15 per cent of costs.
 - Overtime costs were a much lower proportion of the total, though they were significant in a few trusts.
- 70 Further increases in theatre work, beyond the efficiency increases discussed in this review, will be difficult to achieve unless shortages of theatre staff are overcome and trusts reduce staff turnover and sickness absence rates.
- 71 There are significant differences between trusts in the grade-mix of theatre staff. Trusts that have grade structures in the 'richest' quartile spend at least 35 per cent of their staffing budget on grades F /MTO3 and above, while those in the 'leanest' quartile spend at most 21 per cent.
- 72 Even after allowing for the effects of temporary staff, overtime and grade-mix productivity still varies widely, as measured by whole time equivalents of staff per operating hour.
- 73 Evidence suggests that specialty mix is not likely to be a big factor. For example, the average staff cost per operating hour for London teaching trusts is very close to that of small acute trusts. More generally, the variation of staffing costs per operating hour within each type of trust is larger than the variation between types.
- 74 The use of ODPs or theatre nurses as surgical assistants in some theatre units would result in their staffing costs being higher than they otherwise would. This practice is not widespread but further work is needed to gather information about why it happens and whether it is beneficial.
- 75 Theatre units with relatively low staffing levels might be expected either to cancel scheduled lists because they cannot be run safely or to keep the lists running and risk compromising patient care. However, the NHS Modernisation Agency has found that

There are significant differences between trusts in the grade-mix of theatre staff.

only 0.1 per cent of operations in scheduled sessions are cancelled due to a lack of theatre staffing (private communication). And there is no significant correlation between staffing levels and numbers of adverse theatre incidents affecting patients per 1,000 operations.

- 76 Theatre units with relatively high staffing levels have spare capacity and could absorb extra work provided that they have the other necessary resources. Alternatively, they could reduce their staffing.
- 77 In conclusion it appears that the NATN guidelines have been diversely interpreted. The guidelines may need to be revised in the light of how trusts have actually interpreted them. Trusts, for their part, should regularly re-assess their staffing requirements based on an analysis of current workload and the staffing hours needed to meet it (sometime called 'zero-based' analysis), rather than projecting from historical staffing provision.

Theatre equipment

- 78 In one in four units, around 50 per cent of the theatre equipment (by value) has passed its generally-agreed replacement age, and in a few units more than 75 per cent of the equipment is in this state. Trusts provided the Audit Commission with data for a 'basket' of ten types of theatre equipment: numbers of items, by type and by age group. A sample of nine trusts provided estimates for each piece of equipment in the basket of the age when it would be normal good practice to replace it with a new one, because of reliability problems or technological obsolescence, and also the estimated replacement cost. Median replacement costs varied from £7,500 to £45,000 across the basket. Trusts must show items of this value on their asset registers and fund replacements from their capital budgets.
- 79 Of 47 theatre units that spontaneously commented on equipment replacement, 25 said that they had a rolling equipment replacement programme, the rest that they did not. Theatre units usually have to bid against other areas of their trust for scarce capital funds. It seems clear from the data on the age of equipment that significant numbers of units are not succeeding with their bids.
- 80 A sensible policy would be to balance replacement costs against the cumulative breakdown and maintenance charges. Annual monitoring would identify those items of equipment that are coming up for replacement and allow a trust to allocate funds in advance. Additional information on equipment productivity, safety and quality would also need to be taken into account.

Management

Trust management arrangements for theatres

81 Surgery is a major area of activity in most acute trusts. It is crucially linked to the all-important waiting list figures and consumes substantial resources. It is therefore important that the resources and activity are well-managed at the appropriate level and that overall responsibility is taken at trust board level. Below board level there is a need for a theatre management group that brings together all the key theatre users in the trust. Day-to-day management of theatres is more usually the responsibility of a single directorate or division, but in some trusts there is more than one management unit, each looking after a different set of theatres. Management units are typically responsible for:

- operational policies;
- allocating theatre sessions to specialties/surgeons;
- staffing of sessions;
- planning theatre resources for new or changed demands;
- monitoring and influencing performance;
- training and developing staff;
- provision of theatre equipment and medical and surgical supplies; and
- consulting users.

82 The NHS Modernisation Agency reviewed arrangements and made recommendations in its Step Guide (**Ref. 12**), which was issued to trusts in June 2002 when trusts were involved in the Audit Commission's survey. **Exhibit 15** shows a selection of the Agency's recommendations for high-level management alongside the Audit Commission's findings.

Exhibit 15

Management arrangements in trusts

Many trusts have good arrangements.

NHS Modernisation Agency recommendation	Acute Hospital Portfolio finding
Theatre management group (TMG)	
There should be a theatre management group responsible for strategic planning, monitoring and management of theatre performance. It may be supported by sub-groups, for example, theatre users' groups (TUG).	94% of trusts had meetings of TMGs/TUGs in the last 12 months. Of the trusts that had meetings: <ul style="list-style-type: none"> • 85% discussed strategic planning issues; • 89% discussed theatre performance information; and • 89% had authority to make decisions to improve theatre performance.
The recommended core membership should include (among others) a lead surgeon and a lead anaesthetist.	Of the trusts that had TMG/TUG meetings 95% invited surgeons and 96% invited anaesthetists.
Trust board	
There should be an executive director responsible for theatre performance and cancelled operations. The director should be a member of the TMG and present regular reports to the board.	<ul style="list-style-type: none"> • 74% of trusts with TMGs/TUGs invited a board director to their meetings. • In 77% of trusts with TMGs/TUGs the director received minutes of meetings. • In 96% of trusts a board director received information about theatres. • 84% of trusts boards received information about theatres in the last 12 months.

Source: Audit Commission Survey 2002, England and Wales, based on a questionnaire completed by a trust board executive director of each trust

- 83 The conclusion from these results is that many trusts have made substantial progress towards arrangements that conform to the NHS Modernisation Agency's recommendations. There is, however, a small group of around a dozen trusts with insufficient senior management involvement in managing theatre services. Auditors will have asked them to review their arrangements.

Monitoring theatre performance

- 84 This is a problem in many trusts because the theatre managers have difficulty generating necessary management information. A trust's judgements about any performance information that is produced may be inconclusive because standards have not been agreed locally. **Exhibit 16, overleaf**, summarises the findings.
- 85 It is possible that in some trusts some of these aspects of performance fall outside the ambit of theatres (for example, the number of operations done compared with planned is sometimes monitored by surgical and anaesthetic directorates). But in most trusts, theatre units are best-placed to produce the relevant information, so the inability of many units to do so is a serious weakness.

Exhibit 16**The provision and use of theatre information**

Many theatre units do not produce important performance information, or they do not show this information to theatre users, and many have not defined the desired standards of performance.

Type of theatre information	Percentage of theatre units that produced no information in last 12 months for theatre managers	Percentage of theatre units that produced no information in last 12 months for theatre users (surgeons, anaesthetists)	Percentage of units that have no formal standards of performance
Cancelled scheduled lists	20%	33%	35%
Cancelled operations	20%	37%	30%
Utilisation of scheduled theatre hours	28%	41%	38%
Review of list start and finish times	31%	43%	31%
Numbers of patients operated on compared with planned numbers	50%	59%	17%
Incidence of out-of-hours operating	37%	53%	29%
Theatre incident rates and patterns	41%	60%	17%

Source: Audit Commission Survey 2002, England and Wales, based on replies by theatre units

- 86 The inability or failure to produce this information for theatre users means that surgeons and anaesthetists are not objectively informed about their use of theatre resources, even though these staff often have a crucial role in improving theatre performance. Less than two-thirds of theatre units had passed any information to theatre users in the last 12 months. And one-third of units had not had a formal meeting in the last 12 months with every clinical directorate that used theatres.

- 87 The lack of standards of performance in many theatre units reduces the power of information because the opportunity is missed of showing the difference between actual and expected results. For example, the targets given in Exhibit 7 give the standards suggested in this review for the use of scheduled theatre time, and Box C shows a way of presenting the potential consequences of the variances from these standards.
- 88 The fact that the percentage of trust TMGs and TUGs that discuss theatre performance (in Exhibit 15) is greater than the percentage of theatre units that can produce key pieces of performance information (in Exhibit 16) suggests that these high level groups may sometimes be ill-informed. Other clues in the data collected for this review also suggest that even in trusts that have seemingly good information flows, the quality of that information may be poor:
- In one-quarter of theatre units operating hours were missing for at least 5 per cent of cases or lists. Moreover, in one in ten units more than 5 per cent of cases on scheduled elective lists were not classified as elective or emergency. Missing data undermine the power of management information.
 - Forty per cent of units had no formal definition of the start and finish of a scheduled list. A further 10 per cent had only agreed a policy in the last three months (probably influenced by current audit and inspection). The upshot is that managers and users may be unclear on, or disagree about, what their reports on utilisation measure.
 - No association exists between information on the use of theatre time and actual performance. This suggests that the information that is produced currently has insufficient impact on how well services are run.
- 89 On this last point there may be a good deal of frustration among theatre managers and doctors because their theatre unit is unable to produce effective information. Nearly 30 per cent of theatre units (in one-third of trusts) were unable to supply the Audit Commission with basic theatre data on numbers of cases and operating hours from a computerised theatre records system. At least one-half of these units had a computer system (either purchased commercially or developed in-house) but were not able to extract the basic data. These units had to use computer tools supplied by the Audit Commission to run an ad hoc survey of all operations over a six-week period.
- 90 A few trusts may see no value in having anything more powerful than the traditional theatre register, but a far greater number of those who are experiencing frustration are waiting for funds to buy a computerised theatre system. There is much to be said for starting with a simple database system that requires the minimum of data input and that can be easily analysed. Such a 'home-grown' system needs to be designed on the basis of clear ideas about information outputs and must have continuing support from staff who know how to obtain these outputs. Some trusts that have propriety theatre systems have realised that this is a more practical approach and they use their information department staff to analyse data downloaded from a propriety theatre

...there may be a good deal of frustration among theatre managers and doctors because their theatre unit is unable to produce effective information.

system. Trusts that have built up their experience with a basic system will have a better understanding of what they need from a more comprehensive commercial system.

- 91 Time is the key resource for operating theatres, so analysis of theatre activity requires clock times to be recorded and operating hours to be calculated. The Audit Commission found wide differences between trusts, and even between theatre units within the same trust, in the timing points that are recorded and the choice of timing points for calculating operating hours. Fortunately, these differences have not materially influenced the relative performance of individual trusts. Nevertheless, in a national health service it is desirable that theatre time is measured in a uniform way. The 'Theatre Case Start Time' timing point has been in the NHS Data Dictionary (**Ref. 13**) for many years. The NHS Modernisation Agency (**Ref. 12**) recently adopted this and also proposed a finish time (**Box D**). Timing points for scheduled sessions should be formally stated in the theatre operational policy and agreed with all the staff involved so that they know what the start and end of a session means.

Box D

Timing points for measuring operating hours

Timing point	Definition
Start time of list or case	Time patient's anaesthetic commences (induction) if having general anaesthetic, or time patient enters operating room if having local anaesthetic
Finish time of list or case	Time patient leaves operating room, or time patient enters recovery as nearest equivalent

Note: As applied to a list, the start time refers to the first patient and the finish time to the last patient.

Source: Audit Commission

- 92 The Audit Commission website suggests what core theatre data should be recorded and some of the initial analyses (**Ref. 14**). Based on this it is then possible to produce management reports that contain assessments of performance compared with agreed standards and with trends. The NHS Modernisation Agency's Theatre Performance Diagnostic Tools (Cancelled Operations Diagnostic Tool; Key Performance Tool; Theatre Performance Toolkit) (**Ref. 15**) give some recent examples of the management reports that can be produced.

Conclusions

- 93 The review has considered whether trusts can absorb extra work within existing resources in order to meet tough waiting time targets. The general conclusion is that many trusts should be able to find extra capacity within their existing theatres. The needs of both elective and emergency surgery should be carefully balanced. The starting point is to provide better information on theatre performance both for theatre managers and users.
- 94 The majority of trusts do not need more theatre resources in order to increase surgical activity – they need to make better use of what they have. Specifically, they should
- (i) ensure that they have management processes that minimise the number of cancelled operating lists;
 - (ii) plan lists to make full use of available session time and eliminate the factors that prevent this from being achieved; and
 - (iii) identify and minimise the causes of unnecessary gaps between patients while lists are in progress.
- 95 Trusts should make plans for specialties that need more scheduled operating time. Where possible they should receive the extra time by transfer from other specialties that do not need all their current allocation. Where this is not possible, the extra sessions may take longer to provide because they may need extra medical staff or a reorganisation of theatre work patterns may be necessary to enable the existing theatres to absorb the extra sessions.
- 96 Most theatre units have plenty of spare physical capacity but the main use occurs in weekday daytimes when doctors, theatre staff and other staff are available to do the work. Most trusts should have little difficulty in fitting operating work into these favoured periods but some trusts have had to introduce operating lists at the weekend and some in the early evening. Other trusts that are faced with an increasing theatre workload should consider this option as an alternative to capital outlay on building more theatres. Many trusts have inadvertently reduced the effective capacity of their theatres by dedicating a high proportion of theatres to individual specialties or types of work. This practice needs to be reviewed to make sure that the original reasons are still justified.
- 97 Many theatre units have introduced scheduled trauma and emergency sessions in order to reduce out-of-hours operating (and hence reduce delays and risk for emergency patients) and to avoid adding emergency operations to elective lists. But elective sessions are in competition for the same daytime theatre spaces and the pressure may lead to plans to build more theatres. Trusts should first ensure that their scheduled trauma and emergency sessions match the workload. Reductions in sessions are appropriate in some trusts, but increases may be beneficial in some others. They should then routinely check that out-of-hours operating has diminished to an acceptable level.

- 98 While theatre staffing levels are closely related to operating hours, many individual theatre units have staffing costs that are well above or below the national average. Theatre units should review and adjust their staffing requirements each year using the general approach recommended by the NATN.
- 99 Many theatre units use relatively old equipment and seem to be losing out to other trust departments in the bidding for replacement equipment. Equipment replacement policy should be based on a balance of the costs of new equipment against the cumulative charges for maintenance and repair, while also taking account of equipment productivity, safety and quality.
- 100 Many trusts have arrangements for trust-wide management of theatre services that bring together the key professionals to plan, monitor and manage theatre performance. There is a minority of trusts whose boards receive little or no information about theatre performance or where co-ordinating groups below board level lack strong terms of reference or do not involve key professionals. These trusts should review their arrangements with reference to published good practice.
- 101 Managers of many theatre units, and the clinicians that use them, lack important information on operating activity that could help them to improve theatre performance. There is currently little evidence, however, that the production of such information is associated with better performance. The conclusion is that the quality and impact of information for theatres needs to improve substantially in many trusts. Information should include assessments of performance against agreed standards – many units lack these at the moment.
- 102 A key resource is theatre time, but nearly one-third of theatre units cannot produce basic analyses of theatre operating hours because they lack a computerised system, or because the system that they use is unable to output this information. There has been under-investment in information technology for theatres in many trusts but the remedy is not necessarily to purchase commercial systems. Relatively simple, inexpensive in-house database packages supported by staff with analytical skills may be a better choice for theatre units that want to develop their experience with theatre information before investing in expensive systems.
- 103 Trusts should adopt a uniform national approach for recording timing points along the patients' pathways through theatres and for calculating operating hours of cases and of lists.

The Audit Commission gratefully acknowledges advice and comments received from NHS and departmental bodies, Royal Colleges, the NHS Modernisation Agency, Innovations in Care, and others. However, this review does not necessarily represent their views and responsibility for content rests solely with the Commission.

Appendix: glossary of terms

Commissioned theatre

One that is routinely available for use.

Decommissioned theatre

One that has been taken out of use, sealed up, 'mothballed'.

Daytime

08:00 – 17:59 hours.

Elective case

Fundamentally it means a patient whose operation was planned well in advance. In the data collection the technical definition varied to suit local ways of categorising patients. Trusts that used the NCEPOD categories were advised to include categories 3 (scheduled) and 4 (elective).

Elective list

An operating list that comprises solely or mainly elective cases. The list may be intended for a scheduled or an unscheduled session.

Emergency case

Fundamentally it means a patient whose operation was unexpected and could not be planned well in advance. In the data collection the technical definition varied to suit local ways of categorising patients. Trusts that used the NCEPOD categories were advised to include categories 1 (emergency) and 2 (urgent).

Emergency list

An operating list that comprises solely or mainly emergency cases. The list may be intended for a scheduled or an unscheduled session. The term is also used in the review to mean a collection of the individual emergency lists (of different consultants and specialties) that have taken place within a given scheduled emergency session.

Evening

18:00–23:59 hours.

Healthcare assistant/theatre assistant

Non-registered theatre staff who are specially trained to assist ODAs, ODPs, theatre and recovery nurses.

List

A set of patients who are to be operated on in a theatre session. Also means the document that lists the patients and the details of their impending operations.

List start time

The time of the 'event' that defines the start of a scheduled list. The planned time is as stated in the theatre timetable; the actual time refers to what actually happened. Box D in the review suggests that the defining event should be 'patient's anaesthetic commences (induction) if having general anaesthetic, or time patient enters operating room if having local anaesthetic', but theatre units vary in their choice of the event.

List finish time

The time of the 'event' that defines the end of a scheduled list. The planned time is as stated in the theatre timetable; the actual time refers to what actually happened. Box D in the review suggests that the defining event should be 'patient leaves operating room', but theatre units vary in their choice of the event.

List run time

The time difference between the actual list start time and the actual list finish time.

List underrun

If the list run time is less than the planned hours then a list underrun has occurred. The term as used in the review does not necessarily mean that the list finished early, as it might have started late.

List overrun

If the list run time is more than the planned hours then a list overrun has occurred. The term as used in the review does not necessarily mean that the list finished late, as it might have started early.

NCEPOD

National Confidential Enquiry into Perioperative Deaths.

NCEPOD urgency categories

- 1 = Emergency – operation usually within 1 hour;
- 2 = Urgent – operation usually within 24 hours;
- 3 = Scheduled – operation usually within 3 weeks; and
- 4 = Elective – operation at a time to suit both patient and surgeon, resources permitting.

Night

00:00 – 07:59 hours.

Non-specialist trusts

These comprise all trusts that provide mainly acute hospital services, excluding trusts categorised as 'children's', 'orthopaedic' or 'specialist'.

Operating department practitioner (ODP) and operating department assistant (ODA)

Theatre staff who tend to spend most time in supporting anaesthetists in theatres. ODPs are trained for much greater role flexibility and may often be used to support the surgeon.

Operating department orderly (ODO)

Theatre porters. These were outside the scope of the data collection.

Patient operating hours

The hours for one patient are measured from the time of starting anaesthetic (preferred) or time of entering anaesthetic room to time of exiting operating room (preferred) or time of entering recovery. Patient operating hours for a list is the total of the hours calculated for each patient.

Trusts varied in the timing points that they recorded, so some choice of timing points had to be allowed.

When calculating the indicator shown in Exhibit 4, ratios of greater than 100 per cent could occur if it is common practice for there to be one patient in the anaesthetic room while another is in the operating room. In this situation the indicator is reset to 100 per cent.

Planned hours

The planned duration of a scheduled session, based on the time difference between its planned start time and its planned end time.

Permanent staff

Staff who occupy substantive posts and are paid as employees of the trust (as opposed to bank and agency staff who are hired on contract from other organisations).

Recovery nurse

Theatre staff who tend to spend most time in post-operative recovery of patients, ie ensuring patients are fully conscious after anaesthetic and fit to be returned to a ward.

Scheduled case

Usually refers to a patient whose urgency is NCEPOD category 3. See 'NCEPOD urgency categories'.

Scheduled list

A set of patients who are to be operated on in a scheduled theatre session. The time taken to perform the operations on the list does not necessarily equate to the scheduled session time – hence lists 'underrun' and 'overrun'.

Scheduled session

A block of time (typically three to eight hours) that is funded and explicitly included in the theatre timetable several weeks before the list takes place. Theatre staffing rosters are planned in advance to support these sessions.

Scheduled elective session

A timetabled block of time that is intended for elective cases. Other types of case may, however, be included.

Scheduled emergency session

A timetabled block of time that is intended for emergency cases. Other types of case may, however, be included.

Scheduled trauma session

A timetabled block of time that is intended for trauma cases. Other types of case may, however, be included.

Session

A block of theatre time that is used in a given theatre on a given day for a given part of the day. The length of a session can vary. Usually the aim is to use the session continuously, but this is not always achieved.

Specialty

When used to categorise a scheduled list, this is the specialty of the consultant who is allocated the scheduled session. When used to categorise a patient it is the specialty of the consultant who is responsible for the patient's care.

Theatre nurses

Theatre staff who tend to spend most time supporting surgeons in theatres.

Timing point

An event on the patient's pathway through theatres for which the event start time is recorded. Because trusts vary in the timing points that they record, the Audit Commission's data collection allowed some choice in the selection of pairs of timing points (to calculate hours) from a set of ten possible events.

Trauma case

All emergency orthopaedic patients are categorised as trauma in the Audit Commission's data collection.

Trauma list

An operating list that comprises solely or mainly trauma cases. The list may be intended for a scheduled or an unscheduled session.

Whole time equivalents (WTEs)

In general, this means the average number of paid hours per week divided by the standard number of hours per week of the given type of staff. Indicators include the basic hours plus the overtime hours converted to WTEs.

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The Acute Hospital Portfolio is a performance improvement tool for acute and multi-service NHS trusts. It comprises 16 topics ranging from A & E Departments and Bed Management, to Procurement and Supply and Catering.

The topics have been added to the Portfolio in phases of four per year. A 'balanced score card' performance framework is developed for each topic. Data are then collected from all relevant trusts in England and Wales (or taken from existing national sources, where possible). The Audit Commission's appointed auditors then provide each trust involved with a tailored performance assessment based on the national comparative data produced and taking account of the local circumstances of the trust. In-depth audit work may also be undertaken at some poorly performing trusts that demonstrably need it. The national results of the surveys are published in short reviews such as this one and the data, together with computer software to facilitate their use, are released to NHS bodies.

This review reports the national results of the recent assessment of Operating Theatres. It is one of four reviews being published at the same time – the other three are: Bed Management, Outpatients and Waiting for Elective Admission. Most NHS acute and multi-service trusts will already have received their performance assessments from their auditors and agreed action plans for improvement where these are needed for these four topics. The data on which they are based and comparative analysis computer software will be released to NHS bodies on CDs by the end of June 2003.

Trusts have already received similar material for each of the eight topics covered previously and they are currently collecting data for four more topics: Facilities Management, Information and Records, Pathology and Therapy and Dietetics. Feedback to trusts on these topics will take place in the autumn and the national reviews will be published next year.

Full details of the Portfolio can be found on the Audit Commission website: <http://www.audit-commission.gov.uk/itc/acuteportfolio.shtml>

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