Improving Trauma Theatre Utilisation in a District General Hospital

Pei Kee Poh, Andrew Langton, David Read, Jatin Dedhia

ABSTRACT

Introduction: The aim of the audit project was to identify causes of delay for trauma theatres, to manage time more efficiently.

Materials and methods: Over 3 months, we recorded: (a) time of arrival of orthopaedic and anaesthetic consultants to the trauma meeting; (b) if the first two patients were identified and seen the night before; (c) if the operating theatre list was handed on time to the anaesthetist; (d) time of arrival of the 1st patient to the theatre; (e) number of changes to the list order; (f) time of completion of list; (g) reasons for delay and (h) time lost due to delays.

Results: We found that orthopaedic consultants arrived punctually 84.1% of the time as opposed to anaesthetists (35.4%). The first 2 patients were listed the night before on 68 of 91 days (74.7%). On 77 of 91 days (84.6%), the list order was decided by 8:20 a.m. Median time of arrival was 9:03 a.m. and delays occurred 53.8% of the time, rising to 72.7% if the list order was decided after 8:20 a.m. Changes to list orders occurred on 47 of 91 days (51.6%), and this was only for higher priority patients on 16 days. The list went beyond 5:30 p.m. on 40 days (44.0%). Delays occurred on 47 days (51.6%). In total, 2202 minutes were lost due to delays.

Audit follow-through: We presented the findings to the joint trauma multidisciplinary meeting. Among the findings, lack of investigations, consent, unnecessary list changes and having the list order by 8:20 a.m. were identified as key to avoid delays. We aim to repeat the project in other theatres to replicate the benefits.

Keywords: Orthopaedics, Anaesthetists, Audit, Theatre utilisation, Efficiency.


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INTRODUCTION

At a time when the NHS has been implored to save £20bn in spending,¹ the need to maximise theatre time has never been greater. In 2008, The productive operating theatre programme was launched to help NHS trusts identify areas of inefficiency to improve theatre utilisation. Since then, it has helped the University Hospitals of Bristol NHS Foundation Trust to save £2 million by improving list management.² It is estimated that an average-sized hospital (16 operating theatres) could save £1.7 million annually.³

With nearly 200 major trauma admissions a year,⁴ Lincoln County Hospital receives a substantial number of patients requiring surgery for traumatic injuries daily. Despite local efforts to improve theatre utilisation, there remains much inefficiency in the system. The aim of this project is to identify the causes for delays so that theatre time can be utilised better for more operations, prevent overrunning of the list, and save the hospital unnecessary spending. Solutions to remedy the problem can then be applied to maximise efficiency in theatres.

MATERIALS AND METHODS

Data was collected prospectively for a 3-month period between 1st October and 31st December 2012 in trauma theatres at Lincoln County Hospital, where the working hours were between 8 a.m. and 5:30 p.m. Permission was obtained from the Clinical Governance Development Unit within the hospital and all data was anonymised. We recorded:

- If the first two patients on the trauma list were identified and seen the night before by anaesthetist
- If the order of the list was handed in by 8:20 a.m. to anaesthetist
- Time of arrival of the 1st patient in theatre
- Any change to the order of the list (how many times and why)
- Time when the last case is finished (defined as time when patient was brought to recovery)
- Reasons for delays
- Total time lost to avoidable delays causing 'lost operating time.'

All times, such as arrival of the patient in theatres followed those recorded on ORMIS (Operating Room Management Information System), a software used to collect all relevant data in theatres for comparative audit.

A trauma meeting occurs daily at 8 a.m. where a multidisciplinary team of orthopaedic doctors, anaesthetists and a trauma coordinator (a specialist nurse) meet to discuss the cases and operating list for the day. The list order is usually decided by 8:20 a.m. to allow the anaesthetist time to review the patients listed for surgery before the 9 a.m. start in operating theatres. It was thought that punctuality of staff was needed to ensure the list could start on time to avoid delays. The time of arrival of the orthopaedic and anaesthetic consultants to the trauma meeting was thus recorded. This was done by the trauma coordinator to avoid bias.
RESULTS

Within the 92-day period, 91 forms were filled in. Trauma theatre was closed for a day for maintenance.

The time of arrival of the orthopaedic and anaesthetic consultants in the trauma meeting was recorded on 82 days. No data was recorded on 9 days due to the absence of the trauma coordinator. Graph 1, shows that orthopaedic consultants arrived punctually on 69 of the 82 days (84.1%) whereas only 29 anaesthetic consultants arrived punctually on those 82 days (35.4%). On 10 of these days, no anaesthetist attended the trauma meeting.

Out of the 91 days, the first 2 patients on the trauma list were listed the night before on 68 days (74.7%). There was no mention of whether the first 2 patients were pre-listed on 4 days (4.4%) and on the remaining 11 days (12.1%), the first 2 patients were not seen for various reasons as will be discussed under the Discussions section.

On 77 of the 91 days (84.6%), the order of the list was decided by 8:20 a.m. No mention of the decision time occurred on 3 days (3.3%), and on the remaining 11 days (12.1%), the list order was decided after 8:20 a.m.

Graph 2, shows the time of arrival of the 1st patient in trauma theatre. The median time of arrival was 9:03 a.m. and on 49 of the 91 days (53.8%), the 1st patient arrived in theatres after 9 a.m.

Changes to the order of the list occurred on 47 of 91 days (51.6%). Out of these, only 16 of the 47 days occurred when patients had higher priorities. Table 1, shows the number of times the order of the list was changed in a day.

Out of 91 days, the list ran past 5:30 p.m. on 40 days (44.0%) (Fig. 3).

Of the 91 days, delays occurred on 47 of them (51.6%). In total, 2202 minutes of ‘lost operating time’ were recorded.

DISCUSSION

The results of the audit project were presented at a joint trauma meeting between the emergency medicine, anaesthetic and orthopaedic teams. As can be seen above in Graph 1, the time of arrival of the orthopaedic and anaesthetic consultants in the trauma meeting were markedly different. Orthopaedic consultants arrived punctually on 84.1% of the time compared with their anaesthetic colleagues who arrived punctually 35.4% of the time with even a significant of ‘did not attend’ rates (12.2%). While late arrivals did not seem to have much of an impact on surgical start times, anaesthetists were reminded to attend and arrive punctually for the trauma meetings in order to gain an understanding of complex cases, and for any issues or concerns to be related to the orthopaedic team or trauma coordinator so that the necessary investigations can be arranged prior to surgery to avoid any unnecessary delays.

At Lincoln County Hospital, the first 2 patients on the trauma list are identified the night before so that the on-call anaesthetist can review them and relay any concerns or needs for further investigations or treatments to the on-call orthopaedic doctors. This was adhered to 74.7% of the time and the common reasons for patients not listed or seen were:

- Listed patients were on ward leave and were to return at 8 a.m. the next day
- Night on-call anaesthetist was busy with emergency work
- Two patients were identified but not 1st on the list due to list changes
- Only 1 patient was identified to the anaesthetist
- Patient could not be located as either the wrong ward or no ward was stated on the booking sheet.

It was advised during the meeting that should any patients be allowed home, they would probably be fit enough to be listed later in the day for their surgery. This posed a problem for paediatric patients since they should not be starved for a prolonged period of time and the consensus was that these patients should arrive on the ward at 7 a.m. instead or be reviewed by the anaesthetist first before going home. List changes were also discouraged, unless it was for a high priority case, as it takes on average 15 to 40 minutes for an anaesthetic review in an already packed morning before theatre start time at 9 a.m. All staff members were reminded of the importance of having the first 2 patients reviewed where possible to avoid a delayed start to the list.

The order of the list is usually decided during the trauma meeting in the morning, and depends on the number of cases. While list orders were decided by 8:20 a.m. 84.6% of the
time, failure to do this was associated with a delayed start to the trauma list as will be elaborated in the next paragraph.

As mentioned above, the majority of trauma lists starts late, i.e. after 9 a.m. (53.8% of the time) and the median time of arrival of the first patient was 9:03 a.m. (see Graph 2). Major delays occurred on a few days where the list started after 9:30 a.m. due to the following reasons:

• Paediatric retrieval delayed start of trauma list for 3.5 hours on boxing day as there were limited theatre staff
• Anaesthetist scheduled was sick and stand-in anaesthetist could only arrive by 10 a.m. (75 minutes)
• 1st patient was unfit and 2nd patient needed more X-rays prior to surgery (35 minutes)
• 1st patient could not be located the night before and no bloods/ECGs had been performed when the patient was finally found and assessed; 2nd patient was on ward left and returned at 8 a.m. (25 minutes).

While the first 2 scenarios were unavoidable, the 3rd and 4th could have been prevented if these basic investigations were arranged beforehand or identified as missing if they were seen by the anaesthetist the night before. Delayed starts rose to 72.7% if the list order was not decided by 8:20 a.m. This is to be expected, as the anaesthetist will then require time to review the first few patients if they have not been reviewed the night before. Scrub nurses will also have less time to prepare the equipment/trays required and patients can only be sent for later, barring no ward-related delays.

Changes to the order of the list are a common occurrence, occurring on 47 of 91 days (51.6%). Changes are permitted if there are patients with higher priorities, which occurred on 16 of the 47 days, or if there are other valid reasons, as shown in Table 2. Reasons highlighted in red are classified as those that could have been prevented, such

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Table 1: Number of times the list order was changed in a day

<table>
<thead>
<tr>
<th>No. of times list order was changed in a day</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

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Graph 2: Time of arrival of the 1st patient in trauma theatre

Graph 3: Frequency of trauma theatre finishing times
Table 2: Reasons for list changes

<table>
<thead>
<tr>
<th>Patient type</th>
<th>Reasons</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>High priority</td>
<td>Patients (16 out of 47-34%)</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Unfit patient</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Basic investigations (bloods, ECG) not performed/lost</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Tray/equipment problems (afternoon surgeon was not at trauma meeting so equipment preference was not related to staff)</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Further investigations required</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Re-allocated to other theatres/lists</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Surgeons’ availability</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Surgical preference</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Ward issues (patient not ready/no notes)</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Anaesthetic challenging cases (staff sickness and cover was unhappy to anaesthetise 2 years old child)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Patient to come in at 8 a.m. but late/not ready</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Potentially surgically challenging cases (Listed surgeon needed support; on-call consultant would not come in)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Others (Not consented, ametop required)</td>
<td>2</td>
</tr>
<tr>
<td>Not high priority</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

as lack of basic investigations including bloods and ECG as well as ward issues including missing notes or lack of consent for the operation. The number of times the order of the list was changed in a day was also highlighted. As can be seen in Table 1, having the list changed 2 to 3 times in a day on 10 of the 91 days was perhaps a bit excessive. It was again reiterated in the meeting that unnecessary last minute list changes should be avoided as this can lead to build-up in delays as it takes time to get patients on the ward ready and seen, as well as time required for scrub nurses to get the relevant equipment prepared.

Within the 91 days, the list ran past 5:30 p.m. Forty-four percent of the time as shown in Graph 3. If the above mentioned delays were avoided, this would have meant that staff could have perhaps finished on time more frequently.

During this 3-month period, delays occurred on 47 days (51.6%). Graph 4 shows a summary of the reasons for delays throughout this period. The most common reasons were lack of investigations, surgeons not being available, ward-related issues and lack of consent for the procedure. Many of these delays are avoidable and can potentially save precious time, money and allow more cases to be done.

In total, 2202 minutes of ‘lost operating time’ were logged. This excluded any permissible patient turnaround time between cases. Running an operating theatre is one of the most costly operations within any hospital. It has been estimated to cost in excess of £8 per minute per theatre available in a NHS hospital.5 For the period of our study, this would have equated to a wasted cost in excess of £17,500. Add this to all theatres in our hospital (12 excluding obstetrics) for a period of 1 year and it would come up to approximately £850,000 per annum. The above costs may be an overestimate since there are bound to be more delays with emergency and trauma cases; however many of the problems encountered in trauma theatres do occur in elective theatres as well in our hospital. While it is impossible to avoid certain delays between cases, the above examples demonstrate that many of the delays faced in trauma theatres, and certainly in other theatres, can be prevented.

The presentation of the above project to the joint trauma multidisciplinary team yielded much constructive feedback. Avoidable delays such as those due to a lack of basic investigations (e.g. ECGs, group and save for a hip replacement) and informed consent not obtained beforehand were highlighted to the relevant teams. The trauma coordinator has also since organised an induction programme for all ward junior doctors so that they will develop an understanding of the relevant investigations to request for when clerking new admissions and to avoid having the first 2 patients going on ward leave and returning only at 8 a.m. Anaesthetists were also asked to liaise with their orthopaedic counterparts if investigations or consent forms had not been done since ultimately, this was a shared responsibility that will eventually affect all teams. They were also reminded that they too contribute to the trauma meetings and should aim
to arrive punctually. Delayed starts could also be avoided if the order of the list was decided by 8:20 a.m. and this was highlighted to all consultants. Unnecessary list changes were also discouraged to avoid any delays.

Since this meeting, a member of the scrub team now attends all trauma meetings so that equipment requirements can be relayed to theatre nurses. There are also healthcare assistants on the wards now to help prepare patients for theatres. As can be seen, many changes have been mooted since this project and it is only through the efforts of the various specialty teams and new processes that delays can be avoided. We aim to carry out this project in other emergency and elective theatres as well so that precious theatre time can be saved.

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REFERENCES


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