

PRIORITY BRIEFING

The purpose of this briefing paper is to aid Stakeholders in prioritising topics to be taken further by PenCLAHRC as the basis for a specific evaluation or implementation research project. This paper was prepared in 2-3 days.

Does the programme of education called "The Productive Operating Theatre (TPOT)" help prevent untoward incidences and theatre cancellations on the day of surgery, whilst positively impacting on patient experience and staff productivity?

Question ID: 6

Question type: Intervention

Question: Does the programme of education called "The Productive Operating Theatre (TPOT)" help prevent untoward incidents and theatre cancellations on the day of surgery, whilst positively impacting on patient experience and staff productivity?

Population: All theatre staff and support service stakeholders of operating theatres in an Acute medical setting - consultant surgeons and anaesthetists, ODPs (operating department practitioners), theatre nurses, specialty/ department administration and scheduling teams, medical secretaries, directorate managers.

Intervention: The package provides a systematic way of delivering high quality; safe and reliable care to patients across an organization. TPOT has been designed to involve and engage the theatre staff with the service redesign process. When staff take ownership of new systems it leads to a cultural step change ensuring longevity and sustainability. The Freedom Unit (at Derriford) comprises of five theatres who are participating in the TPOT programme (the Freedom Unit is a day case surgery unit for adults).

Control: There are four other suites of theatres Gastro, Cardiac, Main and Maternity who are not participating in any TPOT activities or education. These areas should be used as the control against the Freedom unit. Within the South West Peninsula other Trusts are participating and are at different levels of installation of TPOT; the programme guidance focuses on two theatres at a time. Nationally TPOT has been available to Acute Trusts but full implementation has not yet been reached at any one site.

Outcome: To assess the impact of the 'TPOT programme' and to quantify how much support; resource and time the Trust should dedicate to the programme. The desired outcome would be to reduce untoward events, harm, cancellations etc and support a positive patient experience. Also that the benefits of the programme are visible to the organisation/ Trust Board and PCT, so that it would then be fully supported and therefore implemented across PHNT and other Trusts. The value will be judged on both quantitative and qualitative results, applicable to both patients and staff e.g. staff sickness levels, patient satisfaction, productivity and utilisation of theatre capacity. Interviews with surgeons, anaesthetists and theatre staff, ward staff and patients will be crucial for a robust

representation of the theatre stakeholders.

PHNT had already taken the decision to showcase the Freedom Unit (five theatres) using the TPOT process, during 2010/11. The future vision is to roll out to the remaining 25 theatres within the coming years, so that all Derriford theatres adopt the 'productive' philosophy; to benefit in both quality and financials.

*Please note the details in the box are from the original submission and have been edited where necessary for clarity and precision

TPOT: TPOT was developed by the Institute for Innovation and Improvement in September 2009. It consists of a package of literature and DVDs which support the team through a 12 week plan covering: an organizational readiness visit where problem areas are identified and solutions discussed, programme implementation training days where all staff attend to learn about their role in implementation of new strategies, one-day team work training, four days of implementation support to work the programme to the particular needs of the team, followed by further implementation training and advice on how to measure changes etc. It is designed for all operating theatres and aims to improve the operating theatre so that patient experience and outcomes are improved, team working, communication and efficiency are improved and so that savings can be made on stock reductions and consumables..

The Health Problem:

Data on the number of patient safety incidents reported across the health service in England and Wales over the years shows a steady increase from 125,000 in July-Sept 2005 to approximately 285,000 in July-Sept 2010 with a peak of approx. 325,000 in Oct-Dec 2009. In the acute/general hospital setting approximately 12% of these reports are due to problems with the treatment or procedure, 7% are due to problems with access, admission transfer or discharge, 7% are due to problems with documentation (records and ID) and 6% due to problems with staffing, facilities and the environment. Though these mostly result in no harm to the patient (approx 72%), approximately 22% result in little harm, 6% result in moderate harm, and 1% result in severe harm (not death) (information from the National Reporting and Learning Service).

**Please note these figures do not correspond directly to surgical operative activities in theatres.*

The Institute for Innovation and Improvement estimate that the cost savings per theatre if all the working practices of the TPOT were adopted in the theatre would be £165,000 per theatre per year (or up to £7million for an average Trust in England of 16.5 theatres – see additional leaflet). However, the financial implications have not yet been supported by evidence from implementation.

In Plymouth, in 2010 there were around 46 theatre incidents per month with varying degrees of harm. Please see the additional information section for a

month by month graph (this data is recorded via the PHNT Datix system and overseen by the Patient Safety Team). The cancelled operations rate averaged 1.74% (Nov 2010) for non clinical reasons – ranking PHNT 5th highest in England (DoH Q1 2010-11). This figure has attracted attention from the local SHA, who have been monitoring the situation closely since Jan 2010. For the period April to September 2010 the financial impact to the Trust of 46,998 lost minutes is £115,600 (an average of £2.21 per minute across all 30 theatres at PHNT).

Delays and staff frustrations are a daily occurrence due to problems with supplies, stores, results, patient notes, readiness of equipment and patients, SDU (service data units) instruments, staffing and co-ordination for example.

Patient experiences are becoming more of the focus for quality and are a key element of the Nursing High Impact Actions (developed by the NHS in collaboration with nurses and midwives across the country, these are examples of high quality and cost effective care that, if adopted widely across the NHS, would make a transformational difference) which must be applied to both wards and theatres.

Guidelines:

No formal guidelines for this area could be located. However, in 2010 the Royal College of Surgeons called for an urgent appraisal of national surgical workforce plans and radical improvement in the central approach to workforce planning, to ensure our hospitals are staffed adequately and flexibly to meet the variable demands of the future, though no suggestions are made as to how this might happen.

NHS Priority:

Regional

SW SHA Priorities framework 2008-11

- Implement hospital systems (e.g. care pathways, electronic clinical order and prescribing) that support clinical activity in all acute NHS Trusts in the South West by march 2011
- A year on year reduction in moderate or severe harm arising from medical and clinical error
- Increase reporting where medical errors have occurred
- Improve the productivity of clinical activity by at least £700million per annum by march 2014 (50% achieved by march 2011)

QIPP –TPOT is part of a larger model of 'The Productive series' being led by the Institute for Innovation and Improvement for QIPP. The Productive Series is one of the examples that QIPP is using as evidence of real projects that are going on to improve quality and productivity across health and social care. The other parts

of the model consist of: The Productive Ward; The Productive Mental Health Ward; The Productive Community Hospital; The Productive Leader; and Productive Community Services. 'The Productive Series supports NHS teams to redesign and streamline the way they manage and work. This helps achieve significant and lasting improvements – predominately in the extra time that they give to patients, as well as improving the quality of care delivered whilst reducing costs.

The Productive Series has adopted efficiency techniques previously used in car manufacturing and safety techniques learned in the aviation industry. By working with NHS teams we have adapted them for the NHS in a practical and innovative way. The key to the success of The Productive Series is that improvements are driven by staff themselves, by empowering them to ask difficult questions about practice and to make positive changes to the way they work. The process promotes a continuous improvement culture leading to real savings in materials, reducing waste and vastly improving staff morale'. (http://www.institute.nhs.uk/quality_and_value/productivity_series/the_productive_series.html)

Local

- Plymouth PCT and Torbay healthcare Trust have priorities to improve the self reported experience of patients & users.
- Plymouth PCT also has a priority to improve clinical and cost effectiveness within planned care.

Existing Research:

Published research

No formal evaluation of this programme could be found (the Institute for Innovation and Improvement has been contacted to verify this but no reply has been received). The problem of inefficient operating theatre processes has been of concern since the 1970s and 1980s¹ when health services were focussed on the cost saving aspects of running theatres efficiently. Some research has been conducted to investigate what types of things can be improved in theatres³ (some use particular approaches to the problem^{4,5,6}) and where further research could be useful². The main source of inefficiency appears to be within patient transfer processes³. However, the approaches reported in this briefing^{4,5,6} may not include the patient transfer time as part of the process surrounding theatre to improve. It is possible these types of programmes do exist within hospitals but that they are not reported in an accessible place and are unlikely to be evaluated. The approaches highlighted here tend to use a form of block scheduling where computer simulation can be used to plan the best order of surgery appointments for the day or week taking into account the length of the surgery, the time the patient has to wait and so on. Some approaches to improve operating theatre efficiencies use a catalogue of hypothetical scenarios to make decisions on individual surgery cases⁷. Whereas others⁵ use a theatre management reporting

system to measure theatre utilisation and performance to identify areas where theatre performance can be improved. However, this is not quite the same as the TPOT programme which appears to identify areas for improvement and then develops strategies to make those improvements.

Ongoing research

No ongoing research has been identified.

Feasibility:

This has already run in RDE as a pilot which began in September 2008. A number of positive outcomes are claimed: improved start time and turnaround, better theatre use and staff wellbeing, reduced time spent searching for equipment and 'real time' operational status boards help co-ordinate staff and lists, improved rates of pain control in recovery and an improved safety culture and smoother running of theatre lists with the use of briefing and debriefing before and after the theatre lists are done, but no literature has been found to confirm these. Nationally the TPOT programme is being implemented across the NHS but it does not seem to have been formally evaluated by an external party (there is reference to an evaluation conducted in Feb/March 2010 but no literature). There are TPOT Leads at the following hospitals: Exeter RD&E, South Devon Health Care NHS Foundation Trust, Great Western Hospitals NHS Foundation Trust, North Bristol NHS Trust, Plymouth Hospitals NHS Trust, Poole Hospital NHS Foundation Trust, Royal Cornwall Hospitals NHS Trust, Weston Area Health NHS Trust, Royal United Hospital Bath NHS Trust and Salisbury NHS Foundation Trust. Internationally the package is being sold across Europe and to Australasia. It is therefore anticipated that research and publication in this area by PHNT and PenCLAHRC researching and publicising the findings would enhance the image of an innovative and forward thinking body within the South West Peninsula.

References:

1) Gordon, T., S. Paul, et al. (1988). "Surgical unit time utilization review: resource utilization and management implications." J Med Syst **12**(3): 169-179. As health care providers seek ways to reduce the cost of health care services, hospital operating rooms (ORs) have been identified as potential areas for cost reduction efforts. Cost containment efforts which have shifted significant portions of the inpatient population to ambulatory areas have resulted in an inpatient population which is sicker and more procedure-intensive. Efficient management of operating rooms has assumed even greater importance in this environment. Inefficient or inaccurate scheduling of OR time often results in delays of surgery or cancellations of procedures, which are costly to the patient and the hospital. Approaches to efficient use of ORs include computerized scheduling, utilization monitoring, and refinement of scheduling policies and procedures. In the absence of commercially available software to meet operating room management information needs, Johns Hopkins developed its own system in

1983. This software provides detailed information for daily OR management and long-term planning. The computerized operating room scheduling and monitoring system is described in this article and an operational measure of scheduling accuracy is proposed. Suggestions are made for incorporating this measure into planning and allocation decisions.

2) Blake, J. T. and M. W. Carter (1997). "Surgical process scheduling: a structured review." J Soc Health Syst **5**(3): 17-30.

There is no generally accepted definition of surgical process scheduling available in the literature; nursing researchers, physicians, administrators, and management scientists each view scheduling differently. To overcome this communication problem, a number of authors have proposed conceptual frameworks for surgical process scheduling. These frameworks have unfortunately been either unsatisfactory or incomplete. In this paper, we describe a conceptual framework for surgical process scheduling and use it to classify the existing literature. Results from the review indicate that while operational aspects of advance and allocation scheduling are well understood, further research should be directed towards resolving scheduling issues at strategic and administrative levels. In addition, techniques for integrating operating room (OR) scheduling with other hospital operations are required.

3) Saha, P., A. Pinjani, et al. (2009). "Why we are wasting time in the operating theatre?" Int J Health Plann Manage **24**(3): 225-232.

OBJECTIVES: To determine reasons for delay during elective operating lists and suggest solutions. **DESIGN:** Prospective observational study. **SETTING:** A large under-graduate teaching hospital. **PARTICIPANTS:** Fifty-five consecutive women undergoing elective gynaecological surgery under general anaesthesia. **INTERVENTIONS:** Every time point of individual patient's passage through the operating theatre (patients sent for, arrival in the anaesthetic room, general anaesthetic commenced, transfer to the operating theatre, surgery started, surgery completed, anaesthetic reversed, patient taken to recovery area) was documented. **MAIN OUTCOME MEASURES:** Time intervals between the various time points with particular reference to wait by the anaesthetist and surgeon between cases. **RESULTS:** We monitored 55 operations carried out during 22 operating lists. Apart from the surgery itself (median 81 min per procedure), the longest interval was the time taken to get patients into the anaesthetic room from the ward (median 20 min). Although patients waited a median of 10 min before the start of anaesthesia, if the first procedure on the list was excluded, the anaesthetist was waiting for the patient to arrive in the anaesthetic room in 13/30 (43%) cases, wasting a median of 7 min per case. The surgeon had to wait a median of 22.5 min between operations. **CONCLUSIONS:** Considerable operating theatre time is wasted while patients are transferred to and from the operating theatre resulting in both anaesthetists and surgeons having to wait between patients in a high proportion of cases, averaging 1 h during a 4 h operating list. Surgery could be made more time efficient by ensuring that patients arrive in the operating theatre complex early enough (to reduce time wasted for anaesthetists and surgeons), and by having two anaesthetists

available at the end of surgery, one to reverse the anaesthetic while the other starts the next induction (to reduce time waste for the surgeon), coupled to adequate recovery area capacity.

4) Dexter, F., A. Macario, et al. (1999). "An operating room scheduling strategy to maximize the use of operating room block time: computer simulation of patient scheduling and survey of patients' preferences for surgical waiting time." Anesthesia & Analgesia **89**(1): 7-20.

Determining the appropriate amount of block time to allocate to surgeons and selecting the days on which to schedule elective cases can maximize operating room (OR) use. We used computer simulation to model OR scheduling. Inputs in the computer model included different methods to determine when a patient will have surgery (on-line bin-packing algorithms), case durations, lengths of time patients wait for surgery (2 wk is the median longest length of time that the outpatients [n = 367] surveyed considered acceptable), hours of block time each day, and number of blocks each week. For block time to be allocated to maximize OR utilization, two parameters must be specified: the method used to decide on what day a patient will have surgery and the average length of time patients wait to have surgery. OR utilization depends greatly on, and increases as, the average length of time patients wait for surgery increases. IMPLICATIONS: Operating room utilization can be maximized by allocating block time for the elective cases based on expected total hours of elective cases, scheduling patients into the first available date provided open block time is available within 4 wk, and otherwise scheduling patients in "overflow" time outside of the block time.

5) Donnelly P, W. L. (1999). "Better theatre management through intelligent reporting: the TIME (theatre information, management and efficiency) system." Aust Health Rev **22**(1): 169-183.

Hospital managers, clinicians or their colleges, and the government departments of health are interested in a variety of information for understanding the performance of the health care system and making informed decisions. Intelligent reporting aims to provide the most relevant and reliable information to major stakeholders to facilitate evidence-based practice. The key element in the reporting system is its ability to identify unsatisfactory practice. The TIME (theatre information, management and efficiency) system developed at the North Queensland Clinical School and James Cook University aims to provide intelligible reports for better theatre management. It reflects an effective amalgamation of surgical expertise and systems management principles.

6) Testi, A., E. Tanfani, et al. (2007). "A three-phase approach for operating theatre schedules." Health Care Management Science **10**(2): 163-172.

In this paper we develop a three-phase, hierarchical approach for the weekly scheduling of operating rooms. This approach has been implemented in one of the surgical departments of a public hospital located in Genova (Genoa), Italy. Our aim is to suggest an integrated way of facing surgical activity planning in

order to improve overall operating theatre efficiency in terms of overtime and throughput as well as waiting list reduction, while improving department organization. In the first phase we solve a bin packing-like problem in order to select the number of sessions to be weekly scheduled for each ward; the proposed and original selection criterion is based upon an updated priority score taking into proper account both the waiting list of each ward and the reduction of residual ward demand. Then we use a blocked booking method for determining optimal time tables, denoted Master Surgical Schedule (MSS), by defining the assignment between wards and surgery rooms. Lastly, once the MSS has been determined we use the simulation software environment Witness 2004 in order to analyze different sequencings of surgical activities that arise when priority is given on the basis of a) the longest waiting time (LWT), b) the longest processing time (LPT) and c) the shortest processing time (SPT). The resulting simulation models also allow us to outline possible organizational improvements in surgical activity. The results of an extensive computational experimentation pertaining to the studied surgical department are here given and analyzed.

7) Franklin Dexter, Ruth E Wachtel, Richard H Epstein. Event-based knowledge elicitation of operating room management decision-making using scenarios adapted from information systems data BMC Medical Informatics and Decision Making 2011, 11:2

Background: No systematic process has previously been described for a needs assessment that identifies the operating room (OR) management decisions made by the anesthesiologists and nurse managers at a facility that do not maximize the efficiency of use of OR time. We evaluated whether event-based knowledge elicitation can be used practically for rapid assessment of OR management decision-making at facilities, whether scenarios can be adapted automatically from information systems data, and the usefulness of the approach. Methods: A process of event-based knowledge elicitation was developed to assess OR management decision-making that may reduce the efficiency of use of OR time. Hypothetical scenarios addressing every OR management decision influencing OR efficiency were created from published examples. Scenarios are adapted, so that cues about conditions are accurate and appropriate for each facility (e.g., if OR 1 is used as an example in a scenario, the listed procedure is a type of procedure performed at the facility in OR 1). Adaptation is performed automatically using the facility's OR information system or anesthesia information management system (AIMS) data for most scenarios (43 of 45). Performing the needs assessment takes approximately 1 hour of local managers' time while they decide if their decisions are consistent with the described scenarios. A table of contents of the indexed scenarios is created automatically, providing a simple version of problem solving using case-based reasoning. For example, a new OR manager wanting to know the best way to decide whether to move a case can look in the chapter on "Moving Cases on the Day of Surgery" to find a scenario that describes the situation being encountered. Results: Scenarios have been adapted and used at 22 hospitals. Few changes in decisions were needed to

increase the efficiency of use of OR time. The few changes were heterogeneous among hospitals, showing the usefulness of individualized assessments.

Conclusions: Our technical advance is the development and use of automated event-based knowledge elicitation to identify suboptimal OR management decisions that decrease the efficiency of use of OR time. The adapted scenarios can be used in future decision-making.

