

High-intensity theatre (HIT) lists to tackle the elective surgery backlog

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High intensity theatre (HIT) lists are an efficient and effective measure to tackle elective surgery backlogs without compromising outcomes and safety compared with traditional elective lists. A recent pilot trial in standard and complex urological surgery at a tertiary hospital in the UK proved successful for both the patients and the staff involved.

Waiting lists for elective urological surgery are increasing¹. This issue is multifactorial, but a major factor is the backlog of operations postponed during the COVID-19 pandemic². In particular, cancellations in the second and third COVID-19 waves included the requirement for extra COVID-19 testing for patients with associated delays to surgery, as well as staff sickness. Furthermore, throughout the pandemic, fewer patients underwent investigations for prostate cancer and benign urological disease³. Consequently, we are now faced with an additional volume of patients requiring surgery.

As the pandemic progresses, long waiting lists are a problem across many countries with publicly funded health systems, such as Australia, New Zealand, Canada and Spain^{4,5}. Despite initiatives to reduce them, their persistence continues to frustrate governments and health authorities⁶. Not only do increased waiting times affect oncological outcomes in patients with cancer but they also affect the well-being of patients with benign conditions who are waiting a considerable time for surgery⁷. Addressing this backlog has become a local, national and global priority.

Guy's and St Thomas' HIT list

In the context of financial, resource and workforce limitations, the high intensity theatre (HIT) list model was developed at our institution – Guy's and St Thomas' Hospital, London, UK – to address this backlog. Led by two clinicians (I.A. and K.E.-B.), the model aims to increase operating theatre efficiency for elective surgery by increasing the number of patients being operated on each day. This increase is achieved by meticulous planning and parallel processing of patient care on the day of surgery, aiming to minimize or eliminate turnaround time, minimize non-operative time and maximize operating time. The model has been successfully implemented in a range of surgical specialities and procedures, but our programme aimed to specifically deliver this approach for patients undergoing robot-assisted radical prostatectomy (RARP), having previously trialled the concept in the context of minor scrotal operations.

At our institution we would conventionally schedule two or three major cases on each list of 8–10 hours. On the morning of surgery, patients are prepared in the surgical admission lounge, including consent by the surgical team. Following the theatre team brief, the patient is transferred

to the anaesthetic room at around 0830 hours, where they have further World Health Organization (WHO) checks and then undergo anaesthesia. Each case takes a total of approximately 120–150 minutes and the next patient is collected from the surgical admissions lounge after the preceding patient has been transferred to the recovery area. The turnaround time (the time between one patient leaving the operating theatre and the subsequent anaesthetized patient entering the operating theatre) between cases with no operating occurring is generally ~60 minutes.

In the RARP HIT list, four cases were completed in each theatre in an 8-hour time period. The first patient arrived in the anaesthetic room at 0800 hours and entered the theatre at 0830 hours. The same standard of care was applied as with conventional lists. The next patient arrived at the neighbouring anaesthetic room when the patient currently undergoing RARP was at the point of the nerve sparing. A second anaesthetic team prepared this patient independently, including intravenous access, spinal and general anaesthesia, shaving and strapping to the table in preparation for Trendelenburg position. Once the previous patient left the operating room, the next patient, who was already prepared for surgery, would enter within 2 minutes, meaning the total turnaround time for the list was around 6 minutes, instead of the usual 1.5–2 hours. The fourth case was finished in each theatre by 1615 hours, meaning that the activity finished earlier than a normal operating day, despite the increased number of cases.

If scaled beyond this pilot study, HIT lists could lead to an increase in case volume of at least 150% of the current numbers in our hospital, with a substantial impact on the length of the RARP waiting list. This effect would be seen nationwide across the UK if the programme were to be implemented in other centres. A survey of staff involved in the HIT list found that the overwhelming majority thought that the list was safe and efficient and the staff involved said that they would be happy to recommend their next of kin to undergo a HIT list procedure.

Challenges and limitations

HIT lists require considerable input from the surgical, anaesthetic, managerial and nursing colleagues involved in the planning and delivery of the list. They require institutional buy-in and hospital management to accept that staffing costs will be offset by efficiency gains and an increased number of operations performed. Furthermore, HIT lists involving robotic procedures require availability of multiple robotic systems at the same time, which is a limitation in various health systems⁸. However, regardless of the surgical approach (that is, open versus minimally invasive), the principles to successfully conduct HIT lists remain the same: neither the surgical approach nor the surgical time of the procedure is the most important factor, but rather the turnaround time between cases is the crucial parameter to increase efficiency and efficacy. As such, the concept of HIT lists involving numerous types of operation and various approaches could be applicable to many health-care systems around the globe.

Careful patient selection (patients with low BMI, ASA 1–3 and/or low complexity) is mandatory and both nursing and medical staff involved

at each step of the patient journey must be meticulously prepared (Supplementary Fig. 1 and Supplementary Table 1). Critical analysis of the effect of the programme on patient safety, surgical performance, well-being and satisfaction level of patients and involved staff is necessary to ensure that, when applied on a large scale, the HIT list approach reduces waiting lists without compromising the quality of care that is usually delivered. Given the concurrent financial burden that comes with an increased number of involved staff to perform a time-efficient HIT list, economic viability must be proven. Theatre time is the most expensive commodity; thus, minimizing non-operative theatre time is key⁹. Furthermore, HIT lists are planned with a finish time that is expected to be earlier than normal elective lists. The expected time for a conventional elective triple RARP list in one theatre is 10 hours, whereas for a HIT list with eight cases in two different theatres the expected time is 8 hours, decreasing working hours for staff without rushing to get patients through the process or over-exerting staff.

In order to organize, plan and bring the HIT list to completion, collaboration and clear communication among all staff is essential throughout the project. For example, between nursing staff in preadmission, nursing staff perioperatively and postoperatively on the ward, in recovery and in follow-up clinics, the clinical sterile department and equipment representatives (Supplementary Table 1). Currently, the lists are only taking place during the weekend so that routine elective activity is not disrupted; thus, the HIT lists can be viewed as work done in addition to existing activity.

Preliminary outcomes

The Urology Department at Guys' and St Thomas' Hospital, in collaboration with the Anaesthetic Department, registered a trial before conducting both the urology-specific HIT lists (penoscrotal surgery and RARP). The Trust Quality Improvement & Audit Committee at Guy's & St Thomas' NHS Foundation Trust approved audit number 13948 (for penoscrotal surgery) and 14179 (for RARP) registered on the trust database. We prospectively assessed perioperative and postoperative outcomes, patient safety and satisfaction, and staff well-being and confidence with validated and non-validated questionnaires. Also, economic analyses are being performed to assess cost-effectiveness, as economic evidence is increasingly being used to inform health policies.

Preliminary analyses demonstrated the same perioperative and postoperative outcomes and patient safety for HIT lists as seen with elective lists, and excellent patient and staff satisfaction. Reassuringly, patients involved stated that they would undergo the procedure in the same setting again and would recommend it to their next of kin. Patients appreciated the team cohesion and the procedure being performed rapidly rather than hurrying. All staff involved were reassured that the quality of care, including the anaesthetic and surgical aspects, was the same in the HIT list as a standard elective list. In particular, no shortcuts were taken to improve the turnaround and operating time. Furthermore, achieving a week's worth of operations in a single day and being part of a team that pioneers a technique that could be used to help reduce the National Health Service (NHS) backlog led to a considerable morale boost for the staff involved, which also affected their standard day-to-day work.

Despite an increased number of staff on the HIT lists – almost double the average number of theatre staff and anaesthetists, a surgical team (including surgeon, assistants and bedside assistants) of 1.5 times its usual size for RARP (although unchanged for penoscrotal surgery) and minimally increased numbers of ward and recovery staff – the costs per surgical case being performed on a HIT list versus a traditional elective list are favourable. This balance is mainly achieved by lists finishing earlier (for example, the RARP HIT list took 9 hours but is normally 11 hours; the penoscrotal list took 6 hours and is normally 8–9 hours) and limiting the cost of theatre time not being used for surgery (that is, when facing long turnaround times). Data on outcomes and costs will be reported elsewhere. Experience of the main anaesthetists (I.A. and K.E.-B.) who had been involved in all HIT lists at Guy's and St. Thomas' illustrates a learning

curve throughout the various lists in terms of efficiency and efficacy, while maintaining a high standard of care for the patients and involved staff. The HIT list model has fuelled enthusiasm within NHS staff and is an efficient and satisfying approach for delivering surgery to patients. This factor is of particular importance given the low morale of an increasingly burnt-out health-care workforce since the COVID-19 pandemic.

Since the HIT lists were launched at Guy's and St. Thomas' Hospital in early 2021, NHS Digital data show that the number of patients in the Trust waiting > 18 months for treatment has been reduced by 80%¹⁰. We suspect that HIT lists, if performed more widely, could help other institutions reduce the backlog in surgical care caused by a steadily increasing demand for surgery in publicly funded health systems and accentuated by the COVID-19 pandemic.

Conclusions

HIT lists are feasible without compromising clinical outcomes or patient safety. They demand meticulous preparation, as well as teamwork and ongoing communication throughout the operating day. Importantly, besides tackling the backlog and ensuring a morale boost, the economic impact of such a programme is at least balanced. Although the concept of overlapping surgery is not novel, delivering a system with this level of efficiency that is sustainable, generalizable and scalable warrants consideration.

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Competing interests

The authors declare no competing interests.

Additional information

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