BJU Int 2021; **128:** 681–684 doi:10.1111/bju.15511

BJUI
BJU International

Research Communication

New recommendations to reduce unnecessary blood tests after robot-assisted radical prostatectomy

Radical prostatectomy (RP) is a standard treatment for men with localised prostate cancer. Robot-assisted RP (RARP) is associated with fewer intraoperative adverse events, reduced blood loss and lower complication rates compared to open and laparoscopic RP but delivers comparable oncological and functional outcomes [1]. Furthermore, the use of Enhanced Recovery after Surgery (ERAS) pathways for RARP, have improved patient recovery and experience, reducing costs and maintaining patient safety [2].

Despite the increased use of RARP and adoption of ERAS pathways, the historical practice of routine postoperative blood tests (POBT) remains common. No national or international guidelines exist to aid clinicians to decide whether a patient requires POBT after RARP.

The aim of our present study was to evaluate the safety value of omitting routine POBT after RARP, and to propose recommendations to rationalise their use in clinical practice.

The study followed established 'Plan, Do, Study, Act' (PDSA) quality improvement methodology [3]. The study aims were defined as above and outcomes were defined as below ('Plan'). Baseline data were collected from a retrospective review ('Do') and analysed according to the plan ('Study'). New recommendations were created based on the retrospective review and prospectively assessed ('Act').

Routine prospectively collected perioperative data were retrospectively aggregated from 1040 consecutive patients who underwent RARP with ERAS from 2017 to 2019 in two high-volume tertiary centres in the UK. Data collected included: preoperative patient demographics (age, body mass index [BMI], American Society of Anesthesiologists [ASA] and Charlson CoMorbidity Index [CCI] score), intraoperative data (operative time, estimated blood loss [EBL], blood transfusion, nerve sparing, pelvic lymph node dissection [PLND], and complications), and postoperative data (clinical signs and symptoms, length of stay [LOS], transfusion, and 30-day Clavien–Dindo complications). Subjective intraoperative difficulties, such as difficult dissection and difficult anastomosis, were not regarded as complications. In addition, data related to the timing of discharge and ordering, taking, analysing, and reporting of POBT were collected. All patients had a minimum of 30-days of follow-up. From the retrospective review, 72% of patients were found to have no pre-, intra- or postoperative clinical concerns but still had routine POBT; no patients in this cohort developed a complication.

The study team, composed of experienced, high-volume consultant robotic surgeons at both tertiary centres, reviewed the outcomes from the retrospective data. Expert opinion was used to recommend the following criteria for POBT:

- All patients admitted to high-dependency units (HDUs) postoperatively.
- Patients with intraoperative concerns such as difficult dissection or adhesions, EBL >750 mL, urine leak, bowel, bladder or port-site injury, known coagulopathy and salvage procedures.
- Patients with postoperative concerns such as cardiovascular dysfunction, raised NHS England National Early Warning Score (NEWS) or pyrexia, increasing abdominal pain, tenderness or guarding, nausea or vomiting, high drain output, low urine output or haematuria and wound concern.

Detailed pre-, intra- and postoperative parameters are presented in Table 1. A total of 1040 patients were used to help construct the recommendations and 300 patients were used to assess the new recommendations. Thus, 1340 patients were included in total. The median (interquartile range [IQR]) follow-up was 90 (78-98) days.

Across the study population, the median age was 63 years, BMI was 28 kg/m^2 and the ASA score was 2. In all, 345 (26%) patients had a CCI score of ≥1, with diabetes being the most common comorbidity in 15% of patients. There were no statistically significant differences between the two datasets for preoperative characteristics. As per European Association of Urology (EAU) intraoperative adverse incident classification, there were two Grade II events (two bowel repairs), four Grade III events (three bowel repairs and one vascular injury), and no Grade ≥IV events. Clinical concerns, defined as suspicion raised by the clinical team as per the recommendations, were reported in 221 (16%) patients, the most common concern was increasing abdominal pain in 75 patients (6%).

The overall postoperative 30-day Clavien–Dindo complication rate was 5%. The most common complication was a haematoma, occurring in 21 (2%) patients. A total of 3% of patients went to HDU due to premorbid or intraoperative concerns and 4% had an intraoperative concern flagged by the operating surgeon. In 16% clinical concerns were raised by the surgical team postoperatively. The perioperative transfusion rate was 0.9% (nine patients) and median LOS

Table 1 Pre-, intra- and postoperative variables.

Variable	Total	Derivation dataset	Validation dataset	*P*
N	1340	1040	300	
Preoperative				
Age, years, median (IQR)	63 (61–65)	63 (61–65)	63 (60–66)	0.364
BMI, kg/m^2, median (IQR)	28 (27–29)	28 (27–30)	28 (27–31)	0.462
ASA score, median	2	2	2	0.98
CCI score ≥1, *n* (%)	345 (26)	283 (27)	62 (23)	0.31
Intraoperative				
Operation time, min, median (IQR)	120 (100–140)	120 (100–150)	120 (90–150)	0.126
EBL, mL, median (IQR)	250 (200–300)	250 (200–300)	260 (180–350)	0.371
Transfusion, *n* (%)	3 (0.2)	3 (0.3)	0 (0)	1
Nerve sparing, *n* (%)				
Nil	253 (19)	178 (17)	75 (25)	0.515
Unilateral	543 (41)	432 (42)	111 (37)	
Bilateral	543 (41)	429 (41)	114 (38)	
PLND, *n* (%)	467 (35)	374 (36)	93 (31)	0.236
Concerns and complications, *n* (%)	51 (4)	36 (3)	15 (5)	0.762
EBL >750 mL	29 (2)	21 (2)	7 (2)	
Anastomotic leak	11 (1)	6 (0.6)	5 (2)	
Bowel injury	6 (0.4)	5 (0.5)	1 (0.3)	
Vascular injury	3 (0.2)	2 (0.2)	1 (0.3)	
Bladder injury	2 (0.1)	1 (0.1)	1 (0.3)	
Port-site injury	1 (0.1)	1 (0.1)	0 (0)	
Postoperative				
Clinical concerns, *n* (%)	221 (16)	161 (15)	60 (20)	0.25
Increasing abdominal pain	75 (6)	59 (6)	16 (5)	
High drain output/leak	42 (3)	33 (3.2)	9 (3)	
Cardiovascular dysfunction	39 (3)	25 (2)	14 (5)	
Nausea/vomiting	26 (2)	17 (1.6)	9 (3)	
Low urine output	20 (1)	15 (1)	5 (2)	
Wound concern	5 (0.3)	4 (0.4)	1 (0.3)	
Oxygen desaturations	5 (0.3)	4 (0.4)	1 (0.3)	
Bleeding	5 (0.3)	3 (0.3)	2 (0.6)	
Calf pain	1 (0.1)	1 (0.1)	0 (0)	
Confusion	3 (0.2)	0 (0)	3 (1)	
Transfusion, *n* (%)	6 (0.4)	6 (0.6)	0 (0)	1
Complications (30-day), *n* (%)	68 (5)	48 (5)	20 (7)	0.615
Haematoma	21 (2)	15 (1)	6 (2)	
Anastomotic urine leak	9 (0.6)	7 (0.7)	2 (0.6)	
UTI	11 (0.8)	6 (0.6)	5 (2)	
Ileus	7 (0.5)	5 (0.5)	2 (0.6)	
Bowel injury	5 (0.4)	4 (0.4)	1 (0.3)	
Wound breakdown	5 (0.4)	4 (0.4)	1 (0.3)	
Acute kidney injury	7 (0.5)	4 (0.4)	3 (0.9)	
Renal/ureteric injury	2 (0.1)	2 (0.2)	0 (0)	
Deep vein thrombosis	1 (0.1)	1 (0.1)	0 (0)	
Clavien-Dindo complications, *n* (%)	68 (5)	48 (5)	20 (7)	0.73
Grade I–II	64 (5)	44 (4)	20 (7)	
Grade III–V	4 (0.2)	4 (0.4)	0 (0)	
LOS, days, median (IQR)	1 (1–2)	1 (1–2)	1 (1–2)	0.934
Discharge delays, *n* (%)	62 (5)	62 (6)	0 (0)	0.008*
Re-admission (90-day), *n* (%)	14 (1)	12 (1)	2 (0.6)	0.943

*$P < 0.05$.

was 1 day. No patients died within the short 30-day follow-up period.

Implementation of the recommendations resulted in a decrease of POBT requested from 100% to 27% ($P = 0.001$). The new recommendations were associated with a reduction in POBT related discharge delays from 6% to 0% ($P = 0.008$). No complications were missed, and one patient had an unplanned re-admission within 90-days for urinary sepsis.

Postoperative blood tests should be used to assess variation in haematological or biochemical parameters after surgery where variation is likely to occur and when it is likely to reflect adverse events [4]. The results of our present study show that routine POBT in patients with no adverse clinical findings do not reveal any complications that are not suspected by clinical judgement. POBT alone without clinical assessment, would only be useful in helping to diagnose 43% of all complications. Intra- and postoperative clinical assessment

corroborated with postoperative complications in 99.9% of patients. Therefore, routine POBT should not be a surrogate for thorough clinical assessment.

In the retrospective review, 6% of patients experienced a discharge delay of ≥1 day due to missed venepuncture, mis-labelled, mis-resulted or delayed reporting of POBT. Ravindra *et al.* [5] found in 170 patients that >90% of all blood tests requested for Grade I–III urological procedures were available after 11:00 hours, which resulted in delayed discharge. After issuing local guidelines there was a 75% reduction in POBT requested with no change to patient safety. Over 1.2 million bed-days were lost in the NHS during 2013 due to delayed discharges, with an associated cost of £820 million [6]. Our recommendations may help reduce the costs associated with discharge delays and POBT.

Our recommendations resulted in a 73% reduction in POBT after RARP and show that procedure specific recommendations may significantly reduce POBT requests across a variety of surgical procedures. A review of 532 patients undergoing elective laparoscopic cholecystectomy found that routine POBT do not predict complications but may be of benefit in technically challenging cases [7]. Furthermore, other surgical specialities such as gynaecology and general surgery are transitioning from open surgical techniques to minimally invasive surgery, which has been proven to lower EBL, transfusion and complication rates, and reduce LOS [8]. Therefore, we would recommend that other surgical specialities undertake an evaluation of their use of routine POBT.

Our recommendations capture data from two high-volume centres with experienced surgeons. Further multicentre research is required to provide a more comprehensive picture with specific cost analysis.

To conclude, routine POBT, without a clinical indication, are not necessary after RARP. Intra- and postoperative clinical judgement is highly accurate in predicting and diagnosing complications. Our recommendations can avoid POBT in nearly three out of four patients undergoing RARP. Perioperative transfusion rates are extremely low and hospitals could remove the need for two group and screen samples. Furthermore, our recommendations may reduce discharge delays and increase patient turnover to help the financial, logistical and resource burden on NHS Trusts. Our methodology and recommendations may be applicable to other surgical procedures.

Acknowledgements

Uro-oncology Department University College London Hospitals NHS Foundation Trust. Urology Department Addenbrooke's Hospital, Cambridge University Hospitals NHS Foundation Trust.

Funding

Arjun Nathan was supported by the National Institute for Health Research (NIHR) through an Academic Clinical Fellowship.

Conflict of Interest

All authors confirm they have no disclosure of interest.

Ethical Approval

All patients were registered as part of BAUS national outcomes audit and registered with both institutional audit departments [Ref: 2631 and 11896]. Ethical guidance was followed in-line with the NHS Research Ethics Committee and institutional clinical governance protocols.

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Abbreviations: ASA, American Society of Anesthesiologists; BMI, body mass index; CCI, Charlson Comorbidity index; EBL, estimated blood loss; ERAS, Enhanced Recovery after Surgery; HDU, high-dependency unit; IQR, interquartile range; LOS, length of stay; PLND, pelvic lymph node dissection; POBT, postoperative blood tests; (RA)RP, (robot-assisted) radical prostatectomy.