OPEN

A Single Centre Experience of The Versius Robotic Surgical System in Pakistan

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Abstract

Robotic-assisted surgery (RAS) is increasingly common across specialisms due to its potential to improve surgeon ergonomics and clinical outcomes compared with minimally invasive or open surgery. The Versius Surgical System (CMR Surgical, Cambridge, UK) is a modular, portable robotic system designed to be versatile, adaptable, and easy to use for surgeons of varying experience.

This study describes implementation of Versius across multiple specialties in a single, resource-constrained centre in Pakistan. Training was provided to 20 surgeons, who performed over 2,200 RAS procedures between 2021–2025, sharing between 1–3 Versius systems. A diverse patient population underwent colorectal, general, gynaecological, and urological surgery.

In most specialties, low rates of conversion from RAS to open/laparoscopic surgery were reported. Colorectal surgery conversion rates were high, but comparable with those from conventional laparoscopy to open surgery. Few or no perioperative complications were observed. Across 1,635 urological procedures, the major complication rate was 0.6%, mean post-operative length of stay was 4.2 days, and 94.7% of patients had blood loss <1000mL.

This study represents, to the authors' knowledge, the largest collection of surgeries, and largest series of urological procedures, performed using Versius to date. Clinical and HCRU outcomes were comparable with published literature. Results therefore demonstrate the safe, effective, and versatile implementation of the Versius programme at scale in this resource-constrained setting.

This programme successfully enabled several surgeons across multiple departments to perform high volumes of varying procedures across a diverse patient population.

Key Words: Robot-assisted surgery, Urological surgery, Intraoperative outcomes, Postoperative outcomes, Resource-limited settings

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Introduction

Minimally invasive surgery (MIS) is associated with improved clinical and healthcare resource utilisation (HCRU) outcomes compared with open surgery, including reduced estimated blood loss (EBL), hospital length of stay (LOS), complication rates, and mortality [1-3]. However, conventional laparoscopy is associated with challenges including limited visibility of the surgical field, loss of depth perception, exacerbation of surgeon tremors, and ergonomic limitations. These challenges can lead to surgeon fatigue and discomfort during procedures [4]. Therefore, open surgery remains widely preferred (particularly in complex procedures), with limited uptake of laparoscopy [5].

Robotic-assisted surgery (RAS) has been shown to overcome many of the ergonomic limitations for surgeons associated with conventional laparoscopy, by facilitating improved posture, and reducing localised muscle fatigue and cognitive strain [6-8]. RAS is also shown to benefit patients across surgical specialties: a meta-analysis of patients undergoing prostatectomy found that RAS was associated with a significant reduction in mean operative time (119.8 min versus 214.9 min; $p<0.001$), EBL (228.2 mL versus 408.1 mL; $p<0.001$), complication rate (12.3% versus 16.3%; $p<0.001$), and LOS (2.9 days versus 6.0 days, respectively; $p<0.001$), compared with conventional laparoscopic surgery [2]. Similar results have been reported by other studies comparing RAS and conventional laparoscopy for cholecystectomy, colectomy, hysterectomy, nephrectomy, lymphadenectomy, and salpingo-oophrectomy [9-11].

Despite increasing evidence, RAS uptake remains heterogeneous across geographies, especially in countries with limited resources [12, 13]. The Versius Surgical System (CMR Surgical, Cambridge, UK) is a modular, portable robotic surgical system that can be moved easily between clinical departments. Versius is designed to address key limitations of existing MIS platforms, such as long learning curves, challenges in navigating the body cavity, loss of depth perception, limited articulation, and poor ergonomics [14-17]. Versius is designed to be easily used by both RAS-naïve and -experienced surgeons, and is suitable for procedures on all patients [18-23]. The flexibility and unique features of Versius make it well suited to implementation in high-volume and resource-constrained settings, providing value across a range of specialties, procedure types, and patient characteristics [23].

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The safety and effectiveness of Versius have been demonstrated in numerous studies investigating its use across general and colorectal surgery [23-28]. Furthermore, the Versius Surgical Real-World Data (RWD) Registry captures patient and disease characteristics, as well as intra-operative and 30-day post-operative outcomes, from surgical procedures employing Versius. In a study of 2,083 procedures recorded in the registry, Versius was shown to be associated with low intra- and post-operative complication rates, EBL, and 90-day mortality across colorectal, general, gynaecological, and urological surgery [25, 29].

This study describes the implementation of one of the world's largest robotic surgery programmes in a single, resource-constrained institution in Pakistan. The Sindh Institute of Urology and Transplantation (SIUT) trained 20 surgeons across multiple specialties (and with varying levels of RAS experience) to use Versius, performing a high volume of colorectal, general, gynaecological, and urological procedures on a diverse patient population (ranging 13–85 years old). Between 2021–2025, a maximum of three Versius systems were shared across departments within SIUT to perform over 2,200 procedures. As such, this study constitutes the largest reported cohort of patients to date undergoing procedures using Versius. A particular focus is placed on urological surgery due to the high proportion of urological procedures and highly granular data available.

Methods

Study Design and Eligibility Criteria

This was a retrospective, single-centre cohort study including all patients who underwent robotic-assisted colorectal, general, gynaecological, or urological surgery using the Versius system, between October 2021 and October 2025 at the Sindh Institute of Urology and Transplantation (SIUT; Karachi, Pakistan). Data collection was approved by the institution's local IRB, which provides oversight of clinical research at the site. The retrospective analysis was conducted in accordance with institutional requirements and standard ethical procedures, including the applicable requirements for use of registry data. During the study period, the number of Versius systems deployed concurrently for procedures at the centre varied between 1 and 3. Except for colorectal surgery (where all procedures were performed by a single surgeon), multiple surgeons performed procedures in other surgical indications: general and urological procedures were each performed by one of 16 surgeons, while gynaecological procedures were performed by one of five surgeons (some surgeons operated across multiple specialties). All 20 surgeons completed manufacturer-provided training for the Versius Surgical System (CMR Surgical, Cambridge, UK) and had various levels of laparoscopic and robotic surgery experience. The robotic systems were shared between urology, general surgery, and colorectal surgery using a predefined weekly schedule. Urology had the largest case volume and waiting list, so when another service was unable to use its allocated time, the robotic team was notified in advance and the slot was reassigned whenever possible to maximize utilization and avoid unused operating time.

Following medical record review, patient data were entered into the CMR Versius Surgical RWD Registry: a prospective, multi-centre, international, observational registry with ongoing collection of RWD across a range of specialities. The Versius Surgical RWD Registry includes 30-day post-operative follow up, and all patients included in the Versius Surgical RWD Registry provided their consent for record collection [25, 29]. Data were entered into the Versius Surgical RWD Registry at regular intervals by a delegate who worked with the relevant surgeon and was a staff member at SIUT. All patients with available data were included. For this study, data were retrieved from the Versius Surgical RWD Registry for analysis, and was the sole source of the analyzed variables. Due to the small number of missing values in the registry, no missing values were imputed for included patients with missing data points. Overall, the completeness of data was over 98% for each of the analyzed variables, other than length of stay, which was complete for 95.4% of the total study population.

Study Outcomes

For colorectal, general, and gynaecological surgery, the following outcomes are reported: conversion from Versius to conventional laparoscopy or open surgery, and intra- and 30-day post-operative complications. For urological surgery, the following outcomes are reported (stratified by procedure type): conversion from Versius to conventional laparoscopy or open surgery, EBL, intra- and 30-day post-operative complications, complications of Grade 3 or higher on the Clavien-Dindo scale, operative time, and LOS (defined as the difference between surgery date and discharge date recorded in the registry). Urological surgery was divided into the following procedure types: cystectomy/bladder surgery, pyeloplasty, nephrectomy, prostatectomy, stone management and other procedures (orchidectomy, other connection of ureter, other repair of bladder, orchidopexy, urinary diversion), and ureter surgery (ureter surgery, ureter replantation, and ureterectomy).

Statistical Analysis

Descriptive statistical analyses were performed for baseline characteristics and outcomes. Data are presented as mean (standard deviation [SD]) for continuous variables, as median (range) for continuous baseline variables, and as absolute numbers (percentages) for categorical variables.

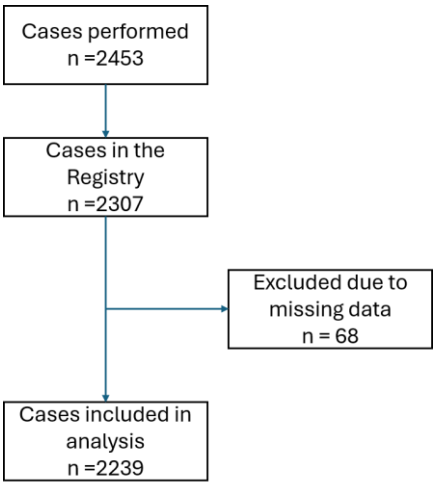
Results

Baseline Characteristics

Patients undergoing All Procedures

A total of 2,453 procedures were completed with the Versius system (between 1–3 platforms were in concurrent use) at the centre during the study period. Of the procedures performed, 2,307 (94.0%) were reported in the Versius Surgical RWD Registry, with registry submission overlooked for a small proportion (146 [6.0%]) [29]. Of the 2,307 procedures recorded in the registry, 68 (2.9%) were excluded due to missing key data (most commonly procedure type). As such, of the 2,453 procedures completed, 2,239 (91.3%) were included in the final analysis. Of these 2,239 included procedures, most (1,635 [73.0%]) were robotic-assisted urological surgery, with 539 (24.1%), 42 (1.9%), and 23 (1.0%) procedures in robotic-assisted general, gynaecological, and colorectal surgery, respectively.

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Patient baseline characteristics are represented in Table 1. Mean age at baseline was similar across surgical specialties (mean age ranged from 43.1–47.3 years), though a diverse population of patients was included (overall age range 13–85 years across specialties). Body mass index (BMI) mean values ranged between 22.1–26.5 kg/m^2 across specialties, though a wide range overall (8.4–54.1 kg/m^2, spanning all categories from "underweight" to "Class 3 obesity") was observed [30]. Some BMI values may be affected by entry errors in the Versius Registry, contributing to the large overall range. Most patients who underwent general surgery were female (335/539 [62.2%]), whereas females comprised the minority of patients who underwent colorectal and urological surgery (8/23 [34.8%] and 528/1,635 [32.3%]).

TABLE 1. Patient baseline characteristics by surgical specialty.

		Colorectal (n=23)	General (n=539)	Gynaecology (n=42)	Urology (n=1,635)
Age, years	Mean (SD)	44.7 (14.1)	47.3 (16.5)	43.1 (9.2)	46.6 (17.4)
	Median (range)	44.0 (19–79)	46.0 (18–72)	44.5 (26–61)	46.0 (13–85)
BMI, kg/m^2	Mean (SD)	24.9 (4.7)	22.1 (3.5)	26.5 (4.6)	23.8 (5.1)
	Median (range)	24.4 (9.4–42.7)	20.8 (17.6–28.3)	26.7 (16.4–36.8)	23.7 (8.4–54.1)
Proportion of females: n (%)		8 (34.8)	335 (62.2)	42 (100.0)	528 (32.3)

BMI: body mass index; SD: standard deviation.

Patients undergoing Urological Procedures

Urological surgeries comprised the majority of procedures included in this study (73.0%), and more granular data were available for these procedures in the Versius Surgical RWD Registry. Baseline characteristics of patients undergoing urological surgery are presented in Table 2, stratified by the type of urological procedure. Patients most commonly underwent nephrectomy (833/1,635 [51.0%]), followed by pyeloplasty (280/1,635 [17.1%]), ureter surgery (148/1,635 [9.1%]), cystectomy/bladder surgery (109/1,635 [6.7%]), and stone management and other procedures (101/1,635 [6.2%]).

TABLE 2. Baseline characteristics, stratified by procedure type, for patients undergoing urological surgery.

		Cystectomy/ bladder surgery (n=109)	Pyeloplasty (n=280)	Nephrectomy (n=833)	Prostatectomy (n=164)	Stone management and other (n=101)[a]	Ureter surgery[b] (n=148)
Age, years	Mean (SD)	52.2 (15.4)	35.2 (14.5)	47.0 (16.2)	69.5 (7.0)	40.3 (13.5)	40.7 (14.2)
	Median (range)	53 (18–82)	32 (14–74)	48 (18–83)	70 (53–85)	40 (13–83)	38 (16–84)
BMI, kg/m^2	Mean (SD)	23.4 (4.0)	22.5 (5.2)	24.2 (5.2)	24.6 (3.5)	23.4 (5.7)	23.7 (5.5)
	Median (range)	23.5 (14.3–36.7)	22.0 (8.9–44.2)	24.1 (8.4–54.1)	24.2 (15.2–36.0)	23.0 (10.6–37.8)	23.8 (9.5–40.4)
Proportion of females: n (%)		12 (11.0)	99 (35.3)	343 (41.1)	0 (0.0)	29 (28.7)	45 (30.4)

[a]Surgical procedures classified as 'other' included orchidectomy, other connection of ureter, other repair of bladder, orchidopexy, urinary diversion. [b]Including ureter surgery, ureter replantation, and ureterectomy.

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BMI: body mass index; SD: standard deviation.

Mean patient age at baseline ranged from 35.2–69.5 years across urological procedures, with patients undergoing prostatectomy having the highest mean age. BMI mean values did not markedly vary across urological procedures (22.5–24.6 kg/m^2), but the corresponding overall range across patients was very broad (8.4–54.1 kg/m^2).

Intra- and Post-Operative Outcomes

Patients undergoing All Procedures

Intra- and post-operative outcomes are presented in Table 3. Apart from patients undergoing colorectal surgery (6/23 [26.0%]), low conversion rates from Versius to conventional laparoscopy or open surgery were reported across general surgery (4/539 [0.8%]), gynaecological surgery (1/42 [2.3%]), and urological surgery (46/1,635 [2.8%]). For colorectal surgery, 3/23 (13.0%) procedures converted to conventional laparoscopy, and 3/23 (13.0%) procedures converted to open surgery.

Very few complications were observed with Versius across all surgical specialties, with no intra- or post-operative complications reported for patients undergoing colorectal or gynaecological surgery. Low proportions of intra- and post-operative complications were reported for general surgery (2/539 [0.4%] and 7/539 [1.2%], respectively), and urological surgery (6/1,635 [0.4%] and 17/1,635 [1.0%], respectively). Complications are reported from the Versius Surgical RWD Registry which is completed frollowing medical record review.

TABLE 3. Intra- and post-operative outcomes by surgical specialty.

	Colorectal (n=23)	General (n=539)	Gynaecology (n=42)	Urology (n=1,635)
Overall conversions from Versius to conventional laparoscopy or open surgery: n (%)	6 (26.0)	4 (0.7)	1 (2.4)	46 (2.8)
Conversion from Versius to conventional laparoscopy: n (%)	3 (13.0)	1 (0.2)	1 (2.4)	4 (0.2)
Conversion from Versius to open surgery: n (%)	3 (13.0)	3 (0.6)	0	42 (2.6)
Intra-operative complications: n (%)	0 (0.0)	0 (0.0)	2 (0.4)	6 (0.4)
Post-operative complications: n (%)	0 (0.0)	0 (0.0)	7 (1.2)	17 (1.0)

Patients undergoing Urological Procedures

Intra- and post-operative outcomes for urological surgeries, stratified by procedure type, are presented in Table 4. Conversion rates ranged between 0.7–3.6% across urological procedure types. As expected, the distribution of patients according to EBL varied considerably across the reported urological procedure types, with 260/280 (92.8%) of patients who underwent pyeloplasty experiencing <100 mL EBL. Very few patients (10/1635 in total; 0.61%) experienced >2,000 mL EBL during surgery, comprising 7/109 (6.4%) for cystectomy/bladder surgery, 1/833 (0.1%) for nephrectomy, and 2/164 (1.2%) for prostatectomy. No patients experienced >2,000 mL EBL during pyeloplasty, stone management and other procedures, or ureter surgery. Intra- and post-operative complication rates were low across urological procedure types.

TABLE 4. Intra- and post-operative outcomes, stratified by procedure type, for patients undergoing urological surgery.

	Overall (n=1,635)	Cystectomy/ bladder surgery (n=109)	Pyeloplasty (n=280)	Nephrectomy (n=833)	Prostatectomy (n=164)	Stone management and other (n=101)[a]	Ureter surgery (n=148)[b]
Overall conversions from Versius to conventional laparoscopy or open surgery: n (%)	46 (2.8)	3 (2.7)	2 (0.7)	30 (3.6)	4 (2.4)	2 (2.0)	5 (3.4)
Conversion from Versius to conventional laparoscopy: n (%)	4 (0.2)	0	0	2 (0.2)	0	0	2 (1.4)
Conversion from Versius to open surgery: n (%)	42 (2.6)	3 (2.7)	2 (0.7)	28 (3.4)	4 (2.4)	2 (2.0)	3 (2.0)
Intra-operative complications	6 (0.4)	0 (0.0)	0 (0.0)	4 (0.1)	1 (0.6)	1 (1.0)	0 (0.0)

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: n (%)							
Post-operative complications : n (%)	17 (1.4)	1 (0.9)	3 (1.1)	5 (0.6)	3 (1.8)	1 (1.0)	4 (3.2)
Grade 3 or higher Clavien-Dindo complications : n (%)	9 (0.6)	1 (0.9)	2 (0.7)	2 (0.2)	3 (1.8)	0 (0.0)	1 (0.7)
Operative time,	149.6 (93.9)	307.5 (197.0)	113.0 (37.0)	139.8 (63.8)	230.0 (71.0)	123.0 (65.4)	85.7 (40.5)
minutes: mean (SD)							
LOS, days: mean (SD)	4.2 (22.9)[c]	4.2 (4.6)	2.3 (2.1)	2.8 (4.6)	4.0 (2.9)	2.4 (3.3)	1.9 (1.6)
Categorical EBL (mL): n (%)							
<100	799 (48.9)	38 (34.9)	260 (93.2)	302 (36.3)	1 (0.6)	69 (68.3)	129 (87.2)
101-500	606 (37.1)	19 (17.4)	17 (6.1)	442 (53.1)	81 (49.4)	28 (27.7)	19 (12.8)
501–1,000	144 (8.8)	19 (17.4)	1 (0.4)	74 (8.9)	46 (28.0)	4 (4.0)	0 (0.0)
1,001–2,000	75 (4.6)	26 (23.9)	1 (0.4)	14 (1.7)	34 (20.7)	0 (0.0)	0 (0.0)
>2,000	10 (0.6)	7 (6.4)	0 (0.0)	1 (0.1)	2 (1.2)	0 (0.0)	0 (0.0)

[a]Surgical procedures classified as 'other' included orchidectomy, other connection of ureter, other repair of bladder, orchidopexy, urinary diversion. [b]Including ureter surgery, ureter replantation, and ureterectomy. [c]LOS data were impacted by erroneous data entries in the Versius Surgical RWD Registry, likely attributed to incorrect month or year entry for the date of surgery and/or date of discharge (LOS is calculated based on the difference between date of surgery and date of discharge as recorded in the registry).
EBL: estimated blood loss; LOS: length of stay; SD: standard deviation.

Intra-operative complications were reported for 4/833 patients (0.5%) undergoing nephrectomy, 1/164 patients (0.6%) undergoing prostatectomy and 1/101 patients (1.0%) undergoing stone management and other procedures. No intra-operative complications were reported for patients undergoing cystectomy/bladder surgery, pyeloplasty, or ureter surgery. Post-operative complications were reported in 1/109 (0.9%) cases for cystectomy/bladder surgery, 3/280 (1.1%) for pyeloplasty, 5/833 (0.6%) for nephrectomy, 3/164 (1.8%) for prostatectomy, 1/101 (1.0%) for stone management and other procedures, and 4/148 (2.7%) for ureter surgery.

Moreover, very few patients experienced any post-operative complications of Grade 3 or higher on the Clavien-Dindo scale: 1/109 (0.9%) for cystectomy/bladder surgery, 2/280 (0.7%) for pyeloplasty, 2/833 (0.2%) for nephrectomy, 3/164 (1.8%) for prostatectomy, and 1/148 (0.7%) for ureter surgery. No patients undergoing stone management and other procedures experienced Grade 3 or higher Clavien-Dindo complications. Post-operative complications of Clavien-Dindo Grade 3 or higher comprised 9/17 (52.9%) of those recorded across urological procedures, suggesting that complications of Grade 2 or lower were under-reported. Average operative time was approximately two hours or shorter for pyeloplasty, nephrectomy, stone management and other procedures, and ureter surgery; mean (SD) operative time was shortest for patients undergoing ureter surgery (85.7 [40.5] minutes) and longest for those undergoing cystectomy/bladder surgery (307.5 [197.0] minutes). Post-operative LOS was typically 2–4 days, with patients undergoing ureter surgery having the shortest mean (SD) LOS of 1.9 (1.6) days and cystectomy/bladder surgery resulting in the longest LOS of 4.2 (4.6) days.

Discussion

Conversion from MIS to open surgery represents a major clinical and HCRU burden, due to increased complication rates and longer hospital LOS compared with unconverted procedures [31-34]. In this series of Versius procedures, conversion rates from Versius to conventional laparoscopy or open surgery were low across multiple surgeons in all specialties apart from colorectal surgery, reflecting RAS conversion rates reported elsewhere for general, gynaecological, and urological surgery [2, 35-37]. While the overall conversion rate observed for colorectal surgery was higher than in some literature reports, the conversion rate from RAS to open surgery for these procedures was comparable with published conversion rates from conventional laparoscopy to open surgery in colorectal surgery [38-44]. The observed conversion rate may also reflect the small sample size of colorectal procedures in the Versius Surgical RWD Registry (n=23) and the potential impact of the learning curve associated with RAS adoption. It is recognized that the RAS learning curve is associated with longer operative times, higher EBL and conversion rates. Evidence suggests that perioperative outcomes for colorectal surgery improve with increasing procedural volume and surgeon experience [45].

Few complications were reported across all surgical specialties in this study, with major complications in 0.6% of 1,635 urological cases and no intra- or post-operative complications observed in colorectal or gynaecological surgery. These findings demonstrate the favourable safety profile of Versius and are consistent with those of published studies on RAS and laparoscopy [46]. Furthermore, the patient population spanned those who were underweight to those with Class 3 obesity (overall BMI range 8.4–54.1 kg/m^2), and an overall age range of 13–85 years. As such, this study demonstrated the favourable safety profile of Versius across multiple surgical specialties and a diverse patient population, indicating its potential utility in wider clinical practice.

Urology represents one of the surgical specialities in which RAS has become widely adopted; for some indications, such as prostatectomy, RAS is now considered standard of care [47]. This

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uptake has been partly driven by the recognised limitations of conventional laparoscopy that may impact perioperative outcomes, including two-dimensional visualisation, restricted instrument articulation, and challenges performing complex reconstruction and suturing [47, 48]. In this study, urological surgery accounted for the majority (73.0%) of procedures performed in this cohort. Across these procedures, conversion rates were low (0.7–3.6%) and Grade 3 or higher Clavien-Dindo complications were uncommon, consistent with published literature reporting on RAS in urology.

Other studies in urology have also demonstrated low conversion rates from RAS to conventional laparoscopy or open surgery, as well as low intra- and post-operative complication rates (though differences may reflect variations in confounding factors and study design) [36, 49]. As such, this study demonstrates the feasibility of RAS with Versius across a range of urological procedures, including prostatectomy and nephrectomy.

Post-operative LOS was generally short across urological procedures in the present study, ranging from 1.9–4.2 days across procedure types. These findings are broadly consistent with published literature on RAS, which has also reported short hospital stays across urological procedures [2]. Although not directly measured, these findings indicate that Versius can help to limit HCRU, including demand on hospital bed capacity [50]. It should be noted that LOS data for urological procedures overall (mean [SD]: 4.2 [22.9] days; median [IQR]: 2 [1-3]) were impacted by erroneous data entries identified in the Versius Surgical RWD Registry, likely attributed to the incorrect month or year being recorded for the surgery date and/or discharge date (from which LOS is calculated), the median and interquartile range more accurately reflect LOS.

The urologists reported that the shorter Versius instruments affected surgical access and increased the risk of robotic arm collisions during upper urinary tract procedures. To address these limitations, they modified the manufacturer-recommended port configuration and repositioned the bedside units (BSUs). These adaptations optimized instrument reach and reduced arm interference while preserving the flexibility and workflow compatibility afforded by independent BSU positioning.

Strengths and Limitations

This study has several strengths. It represents the largest real-world experience to date of RAS using Versius, including more than 2,200 patients from a single centre, which increases the robustness of the findings. Procedures were performed by 20 surgeons across several surgical specialties, which improves the generalisability of the findings. In particular, the large number of urological cases in this study provides strong evidence for the clinical safety and convenience of Versius across multiple urological procedures. This study demonstrates the feasibility of implementing the use of Versius, as part of a large robotic surgery program, at scale in a resource-constrained setting such as SIUT, and supports the wider adoption of Versius in such centres.

However, the study is also associated with a number of limitations. This was a retrospective single-centre study, which may limit the applicability of the results to other centres and countries (although data are collected prospectively in the Versius Surgical RWD Registry from numerous centres worldwide). As with other RWD, inaccuracies and human errors in data entry into the Versius Surgical RWD Registry may have impacted the reported results. The analysis was also descriptive and did not include a comparator group, precluding head-to-head comparison with other surgical approaches or robotic platforms. The relatively small number of patients undergoing colorectal and gynaecological surgery limits the interpretability and generalizability of results within these specialties, and confounding factors that may impact surgical outcomes (including patient diagnoses and case complexity) were not accounted for. While most procedure types were performed by multiple surgeons, all colorectal procedures were performed by a single surgeon, which may limit the generalisability of the outcomes for this group to the wider patient population. Finally, outcomes presented in this study were limited to those recorded within the Versius Surgical RWD Registry, and longer-term follow-up data were not available.

Conclusion

To the best of our knowledge, this study represents the largest series to date investigating the use of Versius, including for urological procedures. The findings add to a growing body of evidence demonstrating favourable outcomes with RAS, including low intra- and post-operative complication rates, conversion rates from Versius to conventional laparoscopy or open surgery, post-operative LOS, and EBL. Although not directly measured, the results also suggest that in addition to the clinical benefits, the Versius system may confer HCRU benefits that can partly offset the acquisition costs of robotic platforms.

Overall, this study demonstrates the safe, effective, and convenient adoption of the Versius Surgical System at a single resource-constrained centre in Pakistan, through the development and implementation of one of the world's largest robotic surgery programmes. The SIUT centre trained 20 surgeons of different specialisms and RAS experience levels, who subsequently performed over 2,200 procedures by sharing a small number of Versius systems between departments across the four-year study period. The surgeons used Versius to operate on a diverse patient population with a wide range of baseline characteristics (including adults and children), with excellent clinical outcomes observed. These findings therefore demonstrate the feasibility of successful adoption of robotic surgical system in clinical practice, including to perform high volumes of procedures on a diverse patient population, in centres with limited resources. A prospective multicentre study could provide additional evidence regarding clinical effectiveness, learning curves, resource utilization, and generalizability.

Trial Registration

N/A.

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