



Article

# Utility and Practicability of Nephrometry Scoring Systems in Contemporary Clinical Practice—An International Multicentre Perspective <sup>†</sup>

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**Abstract:** To conduct a multi-institutional international survey to determine the clinical utility and applicability of nephrometry scoring systems in contemporary clinical practice. **Methods:** A cross-sectional anonymous 15-item online survey was conducted on REDCap between January 2023 and May 2023. Survey invitations were sent via email within Australia and internationally to urologists who are either members of the Urological Society of Australia and New Zealand (USANZ) or the Urological Association of Asia (UAA) or who have direct professional relationships with their members. The survey underwent a trial run on REDCap with several urologists at our institution to test the technical functionality and comprehension prior to dissemination. **Results:** First, 158 responses were collected and analysed. Just over half (51%) responded that they use a nephrometry system in clinical practice, and the RENAL nephrometry scoring system is the most commonly used. Amongst respondents who use a nephrometry scoring system, 63% stated that it helps with counselling patients and 54% stated it serves as a decision-making tool on whether to perform a partial or radical nephrectomy. Furthermore, 54% use a nephrometry scoring system in surgical planning meetings, and 67% believe that it is helpful for research purposes. Common concerns included that they are too time-consuming to complete, they are unhelpful for treatment decision-making and they are only useful for research purposes. **Conclusions:** Nephrometry scoring systems are utilised by roughly one in two urologists in contemporary clinical practice. Further qualitative studies are required to better ascertain perspectives towards them and enhance their clinical applicability.

**Keywords:** nephrometry score; partial nephrectomy; nephron-sparing surgery; surgeon intuition; renal mass; nephrometry scoring system

## 1. Introduction

With the increase in incidental detection of renal masses on imaging and evidence pointing towards the benefits of nephron-sparing surgery where possible to reduce morbidity and mortality associated with renal insufficiency, surgeons are performing more difficult surgeries on more complex renal masses. Nephrometry scoring was developed to help standardise reporting of surgically relevant anatomical features of solid renal masses and uses of validated quantitative metrics to predict treatment success with surgical resection [1].

The two most widely studied and validated scoring systems are the RENAL [2] and PADUA [3] nephrometry systems. These systems assign a numerical value to a set of morphological parameters that are ascertainable with conventional contrast-enhanced computed tomography (CT). These scores objectify the anatomical surgical complexity of a renal mass, assist in surgical decision-making and facilitate the outcome assessment [4].

Despite widespread support within the literature regarding the usefulness of nephrometry scoring systems in clinical decision-making, their applicability and reproducibility remain controversial [5–7]. There are also very limited published data available regarding how frequently these tools are utilised in contemporary clinical practice. The objective of this study therefore was to conduct a multi-institutional international survey to determine the clinical utility and applicability of nephrometry scoring systems in contemporary clinical practice.

## 2. Materials and Methods

An anonymous cross-sectional online survey was conducted on REDCap between January 2023 and May 2023. Survey invitations were sent via email within Australia and internationally to urologists who are either members of the Urological Society of Australia and New Zealand (USANZ) or the Urological Association of Asia (UAA) or who have direct professional relationships with their members. USANZ is the peak professional and representative body for over 700 urologists in Australia and New Zealand. The UAA aims to promote urological care and training throughout Asia and is a consortium of 25 member associations.

We developed a 15-item survey to ascertain urologists' views (see the Supplementary File). The survey underwent a trial run on REDCap with several urologists at our institution to test the technical functionality and comprehension prior to dissemination. Data regarding the current management practices of renal masses were collected using radio buttons to obtain single-answer responses. Views towards the clinical utility of nephrometry scoring systems were captured using checkbox fields, allowing for respondents to select as many choices as they considered relevant. Where respondents felt that their specific concern was not included in the checkbox fields list, we allowed them to include this as a free text by selecting "Other". All submitted responses were automatically assigned a record ID and saved onto REDCap. All responses were exported from REDCap after closure of the survey. Incomplete or duplicate survey responses were excluded. Descriptive statistics were conducted to report responses for each survey question. A subgroup analysis was performed to correlate surgeon experiences, based on the number of partial nephrectomies (PNs) performed, with their use of nephrometry systems using one-way analysis of variance. A  $p$ -value of  $<0.05$  was considered statistically significant.

## 3. Results

Survey responses were collected from urologists across a variety of countries throughout the world. A total of 159 responses were collected, one of which was a duplicate response and was therefore excluded, leaving 158 responses (Table 1). There were no responses that were excluded due to incompleteness. The majority of survey responses originated from Australia (33%), India (25%) and the UK (11%). Most respondents were

involved in the management of renal masses (96%), 88% stated that they performed PNs and 54% had performed greater than 50 PNs as the primary surgeon at the time of completing the survey. Just over half responded that they used a nephrometry system in clinical practice (51%), and the RENAL nephrometry scoring system was the most commonly used system (89%).

**Table 1.** Survey response totals.

Survey Question	n	%
Country of Practice		
- Australia	52	33
- India	41	25
- UK	17	11
- West Europe (Spain, Belgium, France, Germany, Switzerland, Greece, Italy)	13	8
- South America (Brazil, Argentina, Colombia, Peru, Venezuela)	11	7
- USA	8	5
- Southern Asia and the Middle East (Israel, Morocco, Pakistan, Bangladesh, Turkey, UAE)	8	5
- East Asia (Singapore, Japan, HK)	5	3
- New Zealand	2	1
- Russia	1	<1
Are you involved in the management of renal masses?		
Yes	152	6
No	96	4
Do you perform partial nephrectomies?		
Yes	139	88
No	19	12
How many partial nephrectomies have you done so far as primary surgeon?		
1–10	8	5
11–20	17	11
21–50	27	17
51–100	30	19
>100	56	35
No response	20	13
Do you use a nephrometry system in clinical practice?		
Yes	81	51
No	77	49
<b>Urologists who use a nephrometry scoring system in clinical practice (n = 81)</b>		
Which nephrometry scoring system do you use most often?		
RENAL	72	89
PADUA	7	9
SPARE	0	0
C-index	0	0
SARR	1	1
ABC	1	1
How often do you use this nephrometry scoring system?		
Less than half of the time	24	30
More than half of the time	57	70
Who calculates the nephrometry score?		
Primary surgeon	56	69
Trainee assistant	25	31

Table 1. Cont.

Survey Question	n	%
Do you use nephrometry scoring when counselling patients on treatment options?		
Yes	51	63
No	30	37
Do you use nephrometry scoring for deciding when to perform a partial vs radical nephrectomy?		
Yes	44	54
No	37	46
Do you use nephrometry scoring in your surgical planning meetings when discussing treatment options of a renal mass?		
Yes	44	54
No	18	22
We do not have surgical planning meetings	19	23
In what other context do you use this nephrometry scoring system?		
For data collection for research purposes	54	67
For training the novice surgeon	39	48
Other *	5	6
What are your concerns using existing nephrometry systems?		
Lack of familiarity	4	5
Too complex	7	9
Too time consuming	14	17
Unhelpful for patient counselling	14	17
Unhelpful for treatment decision-making	17	21
Lacks good evidence base	9	11
Useful for research only and not clinically relevant	24	30
Other <sup>a</sup>	8	10
None	20	25
<b>Urologists who do not use a nephrometry scoring system in clinical practice (n = 77)</b>		
What are your concerns using existing nephrometry systems?		
Lack of familiarity	10	13
Too complex	9	12
Too time consuming	20	26
Unhelpful for patient counselling	24	31
Unhelpful for treatment decision-making	29	38
Lacks good evidence base	5	6
Useful for research only and not clinically relevant	36	47
Other <sup>b</sup>	10	13

\* Other reasons include perioperative counselling and surgical planning; for communication with other surgeons; decisions about postoperative monitoring (ICU vs ward). <sup>a</sup> Other reasons include “too complicated for patients to understand”; “does not take into consideration surgeon skill and experience”; “hilar lesions behave differently even if they have same nephrometry scores”; “surgeon’s eye is more than enough to measure complexity”.

<sup>b</sup> Other reasons include “I’m a paediatric urologist”; “use experience to ‘calculate’ own score and assess difficulty”; “I don’t manage renal masses/treat kidney disease”.

Amongst respondents who use a nephrometry scoring system, 70% stated that they use it more than half of the time, 63% stated that they use it to help counsel patients and 54% stated it serves as a decision-making tool on whether to perform a partial or radical nephrectomy. Furthermore, 54% use a nephrometry scoring system in surgical planning meetings, and 67% believe that it is helpful for data collection and research purposes. However, some respondents who use nephrometry scoring voiced concerns, such as how they are “time-consuming to complete”, how they can be “unhelpful for treatment decision-making” and how they are “only useful for research and not clinically relevant”.

Thus, 49% of respondents stated that they do not use nephrometry scoring in their clinical practice. The main concerns raised were that they were only helpful for research

purposes only and not clinically relevant (47%), unhelpful for treatment decision-making (38%), unhelpful for patient counselling (31%) and too time-consuming (26%).

We performed a subgroup analysis to examine whether surgeon experience, based on the number of PNs performed, affected their use of nephrometry scoring (Table 2). We found that there was no statistically significant difference in the use of nephrometry scoring nor concerns towards these systems amongst surgeons with various levels of operating experience based on the number of PNs performed as the primary surgeon.

**Table 2.** Subgroup analysis of the responses based on surgeons' PN case number experience.

	Number of Partial Nephrectomies Done as Primary Surgeon (n = 138) †				p-Value
	1–20 (n = 25)	21–50 (n = 27)	51–100 (n = 30)	>100 (n = 56)	
Uses a nephrometry scoring system	15 (60)	13 (48)	17 (57)	31 (55)	0.851
How often do you use?					
Less than half the time	2 (13)	2 (15)	8 (47)	11 (35)	0.088
Greater than half the time	13 (87)	11 (85)	9 (53)	20 (65)	
Used for patient counselling	11 (73)	9 (69)	11 (65)	15 (48)	0.394
Used to decide when to perform a partial nephrectomy	10 (67)	10 (77)	7 (41)	13 (42)	0.117
Used in surgical planning meetings	8 (53)	9 (69)	9 (53)	15 (48)	0.657
Concerns:					
Lack of familiarity	3 (12)	3 (11)	2 (7)	5 (9)	0.905
Too complex	6 (24)	4 (15)	1 (3)	5 (9)	0.095
Too time consuming	7 (28)	9 (33)	5 (17)	10 (18)	0.320
Unhelpful for patient counselling	8 (32)	6 (22)	6 (20)	15 (27)	0.746
Unhelpful for treatment decision-making	8 (32)	4 (15)	10 (33)	20 (36)	0.265
Lacks good evidence base	1 (4)	2 (7)	6 (20)	4 (7)	0.156
Useful for research only	9 (36)	8 (30)	11 (37)	28 (50)	0.286

† One did not provide a response for the number of partial nephrectomies they have performed.

#### 4. Discussion

To the best of our knowledge, this is the first study to date to investigate how frequently nephrometry scoring systems are utilised in contemporary clinical practice by urologists managing renal masses. Nephrometry scoring systems arose out of concern regarding high rates of complications with surgical treatment of renal masses. In 2009, Kutikov and Uzzo developed the RENAL nephrometry scoring system following consideration of the anatomical characteristics of renal masses on cross-sectional imaging as they relate to resectability [3]. In the same year, Ficarra et al. developed a separate preoperative classification system integrating the tumour diameter and five anatomical tumour aspects [4]. The goal of both systems was to standardise reporting of the degree of complexity of surgical resection of renal masses using a structured, reproducible and quantitative scoring system. Several authors have attempted to establish correlations between these nephrometry scores and perioperative outcomes in nephron-preserving surgery; however, the literature reveals significant disparities. While certain studies have emphasised the utility of nephrometry systems in forecasting perioperative results [8–11], others have not established a definitive correlation [12–14].

Our study demonstrated that only 51% of urologists, or just over one in two, use a nephrometry scoring system in their surgical practice. The main concerns highlighted are that they are too time-consuming to complete, they are unhelpful for patient counselling, they do not alter clinical decision-making and they are only useful for academic reporting for research purposes. These responses point towards the impractical nature of the current

nephrometry scoring systems in a busy clinical setting and limited benefits in predicting tumour complexity and a postoperative course.

Various limitations of nephrometry scoring systems have been reported within the literature, including interobserver reproducibility, incomplete quantification of relevant anatomical features and variable correlation with perioperative outcomes. Furthermore, nephrometry classification may have limited utility in predicting outcomes after percutaneous ablation procedures [15].

Various scoring systems have been proposed by other investigators, such as the Diameter–Axial–Polar (DAP) nephrometry system [16], the Zonal Nephro scoring system [17] and Arterial Based Complexity (ABC) scoring system [18], with the goal of improving the RENAL and PADUA classifications. However, these systems failed to be simpler, more reproducible or effective. In 2019, Ficarra et al. proposed the Simplified PADUA Renal (SPARE) nephrometry scoring system, which consists of four parameters (exophytic/endophytic properties, renal rim, renal sinus relationships and tumour size), with the goal of simplifying all available classification systems to improve their reproducibility and also increase their use in busy clinical environments beyond the academic research setting [19]. Despite emerging evidence in favour of the SPARE score for predicting surgical outcomes post-RAPN so far [20,21], it has yet to be externally validated, and none of our respondents stated that they used this simplified scoring system.

More recently, a three-tiered classification called RPN (Radius, Position of tumour, iNvasion of renal sinus) has been developed to assess the surgical difficulty of robot-assisted PN [22]. Due to its simplicity, memorability and accuracy to correlate with perceived surgical difficulty according to highly experienced surgeons, it has potential to be widely applied by urologists within a busy clinical setting.

Beyond nephrometry scoring, surgeon intuition is considered an important tool in predicting perioperative outcomes of nephron-sparing surgery [23]. In a prospective cohort study, Khene et al. (2020) concluded that a surgeon's clinical judgement was a better indicator compared to nephrometry scoring to predict perioperative morbidity and the trifecta achievement of robot-assisted PN [6]. The surgeon's intuition and subjective "gut" feeling to anticipate complications could also be helpful to counsel patients and guide treatment. This view was supported by multiple survey respondents, who stated that a surgeon's experience and intuition when looking at a renal mass on imaging were important factors that allowed for the measurement of tumour complexity and the optimal surgical approach. This suggests that experienced surgeons can intuitively measure operative risk during the imaging assessment of tumour characteristics, potentially precluding the need for complex scoring systems. Our subgroup analysis, however, did not show a statistically significant difference in the use of nephrometry scoring amongst surgeons with various levels of operating experience based on the number of PNs performed as the primary surgeon, therefore suggesting that experience alone may not be a predictor for the use of nephrometry scoring in clinical practice.

The advantage of scoring systems is that they provide a common language that clinicians can use to communicate and compare the anatomical complexity of renal masses within surgical planning meetings or research settings. However, this survey demonstrates mixed opinions towards the applicability of nephrometry scoring in clinical practice, which echoes concerns raised by multiple investigators regarding the limited abilities of these systems to predict perioperative outcomes for renal masses [6,7]. This highlights the need to build and validate a tool for renal masses that assess individual patient risk for perioperative outcomes and complications.

Our study had several limitations. Despite our efforts to sample urologists from all around the world, there is a selection bias towards those who are members of USANZ and

UAA, as can be seen by the greater response rates from urologists practicing in Australia and India. Our survey is lacking representation from urologists practicing in Europe, North and South America and Africa, and so, our conclusions may not be applicable to these groups. Secondly, our survey is cross-sectional, and responses provided regarding concerns towards nephrometry systems are not necessarily causal explanations behind their lack of use. Thirdly, most urologists surveyed had an appointment with an academic teaching centre, and this may have introduced an inclusion bias, as urologists at these centres may favour the use of nephrometry scoring for research and teaching purposes. Furthermore, our study does not reflect changes in attitudes or views towards nephrometry scoring systems over time, which would be an important consideration, as one accumulates greater experience and technical expertise with training.

Given the above limitations, future studies on the practicality of nephrometry scoring systems should firstly focus on diversifying recruitment to incorporate many urological societies around the globe in order to access a broader range of participant urologists and increase the sample size, thus reducing the selection bias and enhancing the generalisability of the survey findings. Next, a longitudinal study design would be helpful in tracking changes in attitudes and views towards nephrometry scoring systems over time, providing insights into the impact of experience and training. Finally, inclusion of a qualitative study design, such as conducting interviews with urologists to gain a deeper understanding of their perspectives, concerns and experiences with nephrometry scoring systems, would add further context to and reasoning for the quantitative findings.

## 5. Conclusions

The complexity of surgically managing a renal mass is not limited to the nephrometry score only but also depends on surgeon experience and intuition. Our survey demonstrates that nephrometry scoring systems are utilised by around one in two urologists in contemporary clinical practice. Commonly voiced concerns are that they are too time-consuming to complete, they are unhelpful for treatment decision-making and they are only useful for research purposes and not clinically relevant. Despite its widespread use as a standardised method of reporting within the urological literature, its clinical applicability and reproducibility remain controversial. Further qualitative studies are required to better ascertain the perspectives towards these scoring systems to enhance their applicability in real-world clinical practice.

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/siuj6010007/s1>. Included in the supplementary materials is the 15-item survey conducted on REDCap, aimed at ascertaining urologists' views towards nephrometry scoring systems.

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