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Are surgical fees between specialties fair?

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Singapore Med J 2021, 1–15

<https://doi.org/10.11622/smedj.2021186>

Published ahead of print: 8 November 2021

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INTRODUCTION

Remuneration for services rendered is usually overlooked as a taboo subject. Opinions on who receives the most appropriate financial compensation are divided and controversial. However certain specialties are generally regarded to be the more lucrative than others. Equity of compensation is a different matter. One may argue that the more technically challenging the field is, the higher the compensation it should command. Others would contend that specialties which deal with more complicated patients, perform higher risk surgeries or are at a higher risk of litigation should be accorded higher reimbursements.

In restructured hospitals in Singapore, the Ministry of Health⁽¹⁾ has been compensating surgeons for each surgery performed using a system of Table of Surgical Procedures (TOSP), also referred to as Surgical Tables. Surgical fees are determined by a Professional Fee Structure (PFS) which is linked to the TOSP. Linking the PFS to the TOSP may not have been the original intention of the TOSP, but this has become current practice. The TOSP is a classification of surgical procedures into 21 tables (ranging from Table 1A/B/C to Table 7A/B/C) based on their complexity, and currently covers about 2350 procedures. The use of Medisave and MediShield claims for surgeries also takes reference from the TOSP. Each surgery has an assigned Surgical Table which is designed to correlate to technical difficulty, specialist expertise requirement, duration of surgery as well as peri-operative costs to the hospital (including hospitalisation charge). TOSPs are Medisave reimbursable codes which reimburse hospitals for the other costs incurred from the surgery and any associated hospitalisation from a patient's Medisave accounts. The higher the Surgical Table, the larger the surgical fee. However, many factors that determine the Surgical Tables are subjective. Arguments have been made that surgeons of certain specialties are undercompensated.

Our primary hypothesis is that hourly reimbursement rates vary significantly across surgical specialties in Singapore. Our secondary hypothesis is that more complex operations,

with higher surgical tables, do not translate into a higher hourly reimbursement rate. In this study we have quantitatively compared the remuneration of different surgical specialties in terms of surgical fee per hour of operating. This may provide policy makers with data to reevaluate the current structuring of surgical fees.

METHODS

A total of 9369 operations performed by consultants/senior consultants at a restructured government hospital in 2011 were retrospectively analysed. This was across ten surgical disciplines of Urology, Ophthalmology, Otolaryngology, Orthopaedic surgery, Paediatric surgery, Hand surgery, General surgery, Vascular surgery, Cardiothoracic surgery and Obstetrics & Gynaecology. 93 of the most common operations performed across these specialties were included in the study. The fields of Plastic Surgery and Neurosurgery were not included in the study due to a lack of available surgical data.

The 10 most common operations of each specialty, comprising a total of 5712 operations were included into the study for analysis. They represented the majority of a surgeon's case load and provided a starting point for comparison of surgical fees. The top 10 operations, comprise the bulk of a surgeon's work and contribute a significant portion of his/her final take home salary. Operations that made up less than 1% of the yearly workload were excluded. Thus, for Obstetrics & Gynaecology and Vascular surgery, only the top 7 operations, and for Ophthalmology only the top 9 operations were included in the analysis. Only surgeries performed by consultants or senior consultants as first surgeons were included on the assumption that these surgeons were experts in their field and the operations were carried out as efficiently as possible. Surgeries performed by associate consultants and registrars were excluded. We calculated the mean duration of the top 10 operations in each surgical field with the hourly rate paid to the performing surgeon (based on the 2019 Professional Fee Structure).

We defined operation duration as the time from patient entry into the operating room to the time patient left the operating room because the surgeon was required to be present throughout this period. The operative times for all included operations was recorded using a system in which a patient's Radio-frequency identification (RFID) wristband was scanned upon entry and exit of the operating theatre. The mean duration of each specific operation was obtained. We sought to confirm that our operative times were within 10% of published operative times for common surgical procedures.⁽²⁻⁵⁾

Surgical fee per operation (in SGD) was calculated based on the Surgical Tables for the year 2019⁽¹⁾ with each operation corresponding to a particular table of charge. The surgical fee per operation was divided by the mean duration (in hours) of each operation and tabulated for comparison. The proportion of total specialty case load, represented by each operation, was also calculated for each of the top 10 surgeries and tabulated.

RESULTS

The top 10 operations from each of the 10 surgical fields were found to represent more than half of the total surgical case load (50.46% - 82.20%) for all fields except for general surgery (38.51%) and orthopaedic surgery (40.45%).

Supplementary Tables 1–3 (Appendix) show our tabulated findings for the top operations of each field. Surgical Fees range from as low as \$72.60/hr to as high as \$1167.60/hr. We found that certain specialties have a greater proportion of operations which are of higher Surgical Tables (Figure 1). Cardiothoracic Surgery has 12.63% of its workload coming from Table 7 operations and 27.28% from Table 6 operations. At the opposite end of the spectrum, 24.68% of Paediatric Surgery's workload comes from Table 1 surgeries. Paediatric surgery also has no Table 4 or higher operations amongst its top 10 operations.

Interestingly, fields with a predominance of higher Surgical Tables do not necessarily have higher surgical fees per hour. Figure 2 shows that the fee per hour paid to cardiothoracic surgeons for 39.41% of their operations is \$200-\$399/hr, despite cardiothoracic surgery having the highest proportion of Table 6 and 7 operations. In comparison, ophthalmologists are reimbursed at the highest rate of \$1000-\$1200/hr for 67.17% of their workload.

There is a weak trend towards increasing Surgical Fee/hour at higher Surgical Tables (see Figure 3). However, most surgeries have a peak Surgical Fee/hour at Table 3 and 4 operations, which then decreases for operations of Table 5 and above.

Even within a Surgical Table, there is a wide range of Surgical Fees/hour between specialties. At the lower end of the Surgical Table spectrum, Table 3A operations range from \$381.00/hr to \$1034.00/hr. In the middle, Table 4A surgeries range from \$440.40/hr to \$1167.60/hr, At the higher end of the Surgical Tables, Table 6B operations range from \$486.60/hr to \$1160.00/hr.

DISCUSSION

Our results show that some surgical fields have a greater proportion of lower Surgical Tables compared to others. For example, all top 10 operations for paediatric surgery are table 3B and below whilst 98% of the top 10 operations for ophthalmology are table 4A and above. This results in some fields receiving a lower total income as the bulk of their operative work is charged at lower Tables.

Despite the first impression of certain surgical fields having a greater proportion of higher Surgical Tables amongst their most common operations, higher table codes do not necessarily translate into higher Surgical Fee/hour. Cardiothoracic surgery is the field with the highest proportion of Table 6 and 7 operations, yet 42% of its workload is billed at a comparatively lower Surgical Fee/hour rate of <\$399/hour. This is partially the effect of long

operative durations and anaesthesia preparation time, which reduces the Fee/hour. While the absolute amount paid to a surgeon for a Table 7 operation is higher, surgeons' incomes are higher when they perform multiple lower Surgical Table operations in succession as opposed to a single higher Table surgery. This effect is demonstrated in Figure 3 which shows that across all fields, the peak Surgical Fee/hour occurs between Table 3A-4A operations. These operations are generally of lower complexity, yet surgeons are compensated the most in terms of Fee/hour for these procedures. This is because despite the absolute sum paid for these surgeries is moderate, the operative times are short.

Surgical fields such as paediatric surgery and hand surgery are disadvantaged by their lack of higher fee per hour operations in the majority of their operative load. The fields of ophthalmology and orthopaedic surgery are well compensated on a Fee/hour rate. The single most common operation of each field can also be a significant contributor to overall income. For example, 62.57% of the Ophthalmology workload is Cataract Extraction which pays a disproportionately high \$1162.80/hour, while 29.11% of Hand Surgery's workload is wound debridement (29.11%) which pays \$273/hour. Ophthalmologists have 67.17% of their workload reimbursed at a rate of \$1000-\$1200/hr, while hand surgeons are paid less than \$399/hour for 52.83% of their workload. This is consistent with data from the Annual Medscape Physician Compensation Report 2020⁽⁶⁾ from the United States which reports the fields of Orthopaedic Surgery and Ophthalmology being amongst the top 5 highest earning surgical specialties. The specialties of Ear, Nose & Throat Surgery and Urology are also within the top 5 in the United States, but are not as highly compensated in Singapore.

A higher Surgical Table should reflect increased surgical risks and complexities for a specific operation. However, this is not clearly demonstrated in the current Table scheme. For example, Total Knee Replacement, a table 6B operation, pays \$777.60/hour but Coronary Artery Bypass Grafting (3 vessels or less), an arguably more complex and risky procedure, is

a table 6C operation that pays \$388.20/hour. There is high fee variation even within identical Surgical Tables. Cataract Extraction is a Table 4A surgery reimbursed at \$1162.80/hour while a hemithyroidectomy performed by ENT, also a Table 4A surgery, is reimbursed at \$287.40/hour

Higher Surgical Tables are expected to capture the increased complexity of cases. Yet the same surgery performed by Paediatric Surgery and General Surgery can result in a different Surgical Fee/hour. An appendicectomy performed on a child is intuitively more challenging than performed on a fully grown adult. Yet the Surgical Fee/hour for an appendicectomy performed by Paediatric Surgery is \$226.20/hour and when performed by General Surgery is \$267.60 per hour. This is because both operations have the same Surgical Code and absolute fee of \$550 but the total operative duration for a Paediatric appendicectomy averages 2 hr 26 min while an adult appendicectomy averages 1hr 58 min. This reflects how Surgical Tables do not comprehensively capture situations of increased anaesthetic and surgical complexity and paradoxically reimburse more challenging surgeries at a lower Surgical Fee/hour.

The existing Professional Fee Reimbursement in Singapore impacts not only surgeons, but also anaesthetists. Because anaesthetic fees are linked to the same Surgical Tables. This may contribute to sub-specialization in Anaesthesia not developing equally across specialties. Many superspecialist fields such as Anaesthetic Paediatric Surgery may not progress optimally because anaesthetists with fellowships in these fields could be reluctant to practice exclusively in these areas as of the impact on their income.

We recognise several limitations in this study. The difficulty of each operation differs from patient to patient resulting in variable operative time. However, we have mitigated some of this variability with a large number of analysed cases and by excluding operations that contribute less than 1% of the overall caseload. We also elected to present our data with the simple statistic of mean surgical fee/hour as opposed to providing a 95% confidence interval

range of surgical fees per hour for each operation, as this would make it difficult for readers to compare easily between surgeries.

We propose that the Surgical Table of each surgery should reflect the difficulty of the operation, the level of expertise required and should pay surgeons fairly for their time. Thus, a comparator of Surgical Fee/hour was utilised. However, this does not take into account the other aspects of managing the patient's disease such as pre and post-surgical care, which also varies between operations. We also acknowledge that current Surgical Tables are designed to factor in not only surgical complexity, but the cost of specialized equipment used during the operation. This equipment has a limited shelf-life and its amortized cost per use can result in operations that utilize them, having a higher Surgical Table.

A surgeon's salary is not derived only from surgeries performed. Institutional surgeons receive a base salary in restructured hospitals and clinic procedures also contribute to overall salary. Analysis of reimbursement of non-operative procedures and base salary was outside the scope of this study. Human resource measures to compensate for imbalances in total remuneration may be in place but are not transparent, are unlikely to be standardized and may not fully compensate for the biases introduced by linking PFS to TOSP. If the direct fee for service model is to be continued the findings of this study need to be carefully considered. An alternative is to move to a fixed salary structure as some public hospitals have done.

By analysing the top 10 operations of each field, we were able to analyse the majority of operative workload across most Specialties. However, the fields of General Surgery and Orthopaedic Surgery have a more diverse surgical repertoire with multiple subspecialties. Thus 61.49% and 59.55% of the workload respectively was not captured in this study. Our findings would not be directly applicable to surgeons practicing wholly within the subspecialties of these disciplines.

We defined operative duration as the time between entering and exiting the operating room, because surgeons are present in the operating room during anaesthesia administration and reversal. This does not correlate perfectly with actual operating time as measured by the duration between 'Knife to skin' and 'Skin closure' but the former is a more accurate reflection of 'work time'. Incorporating anaesthetic time revealed the differences in Surgical Fee/hour between Local Anaesthesia cases which have a faster turnover rate between cases and General Anaesthesia cases which require longer preparation and reversal.

In conclusion, the current Surgical Tables show significant differences in fees between the various surgical fields. They also do not show an incremental increase in reimbursement per unit time at higher tables of charge despite the understanding that these operations are more complicated. Linking the surgeon's fee to the Table Of Surgical Procedures introduces disparity in compensation across specialities. We hope this paper will spark useful discussion amongst policy makers, human resource departments and surgeons alike.

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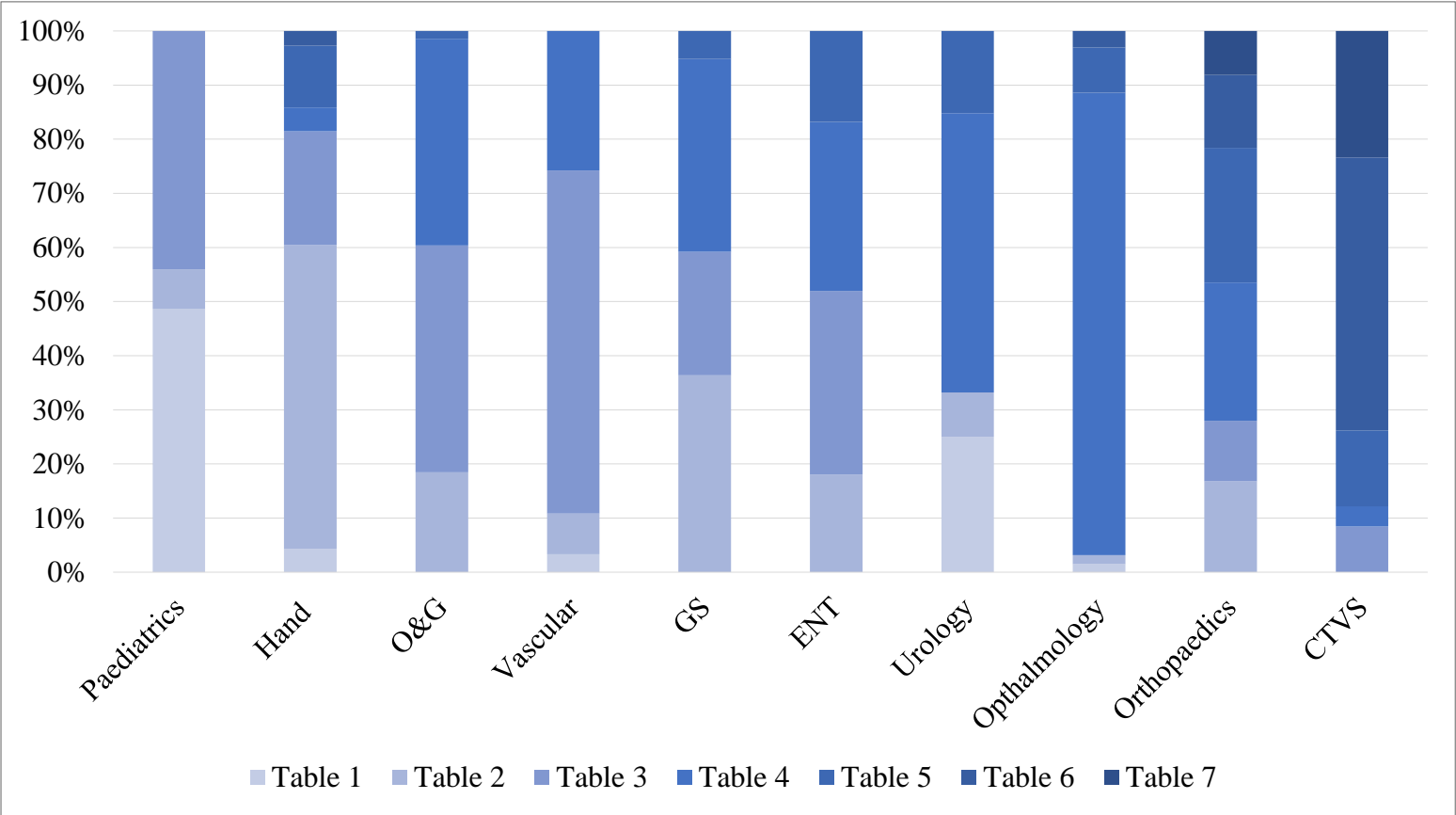


Figure 1. Proportion of Surgical Tables by Speciality

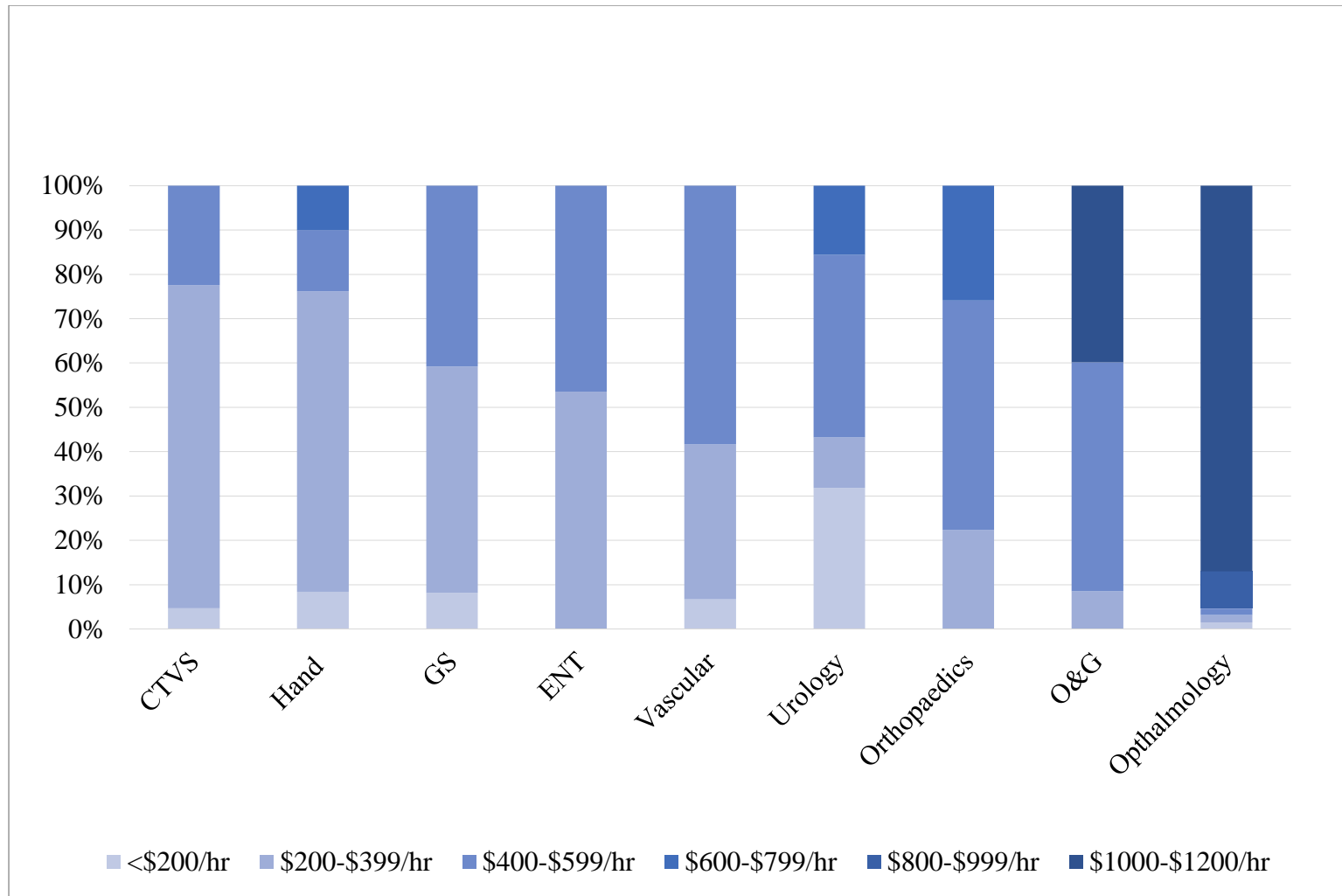


Figure 2. Proportion of Surgical Fees/Hour by Speciality

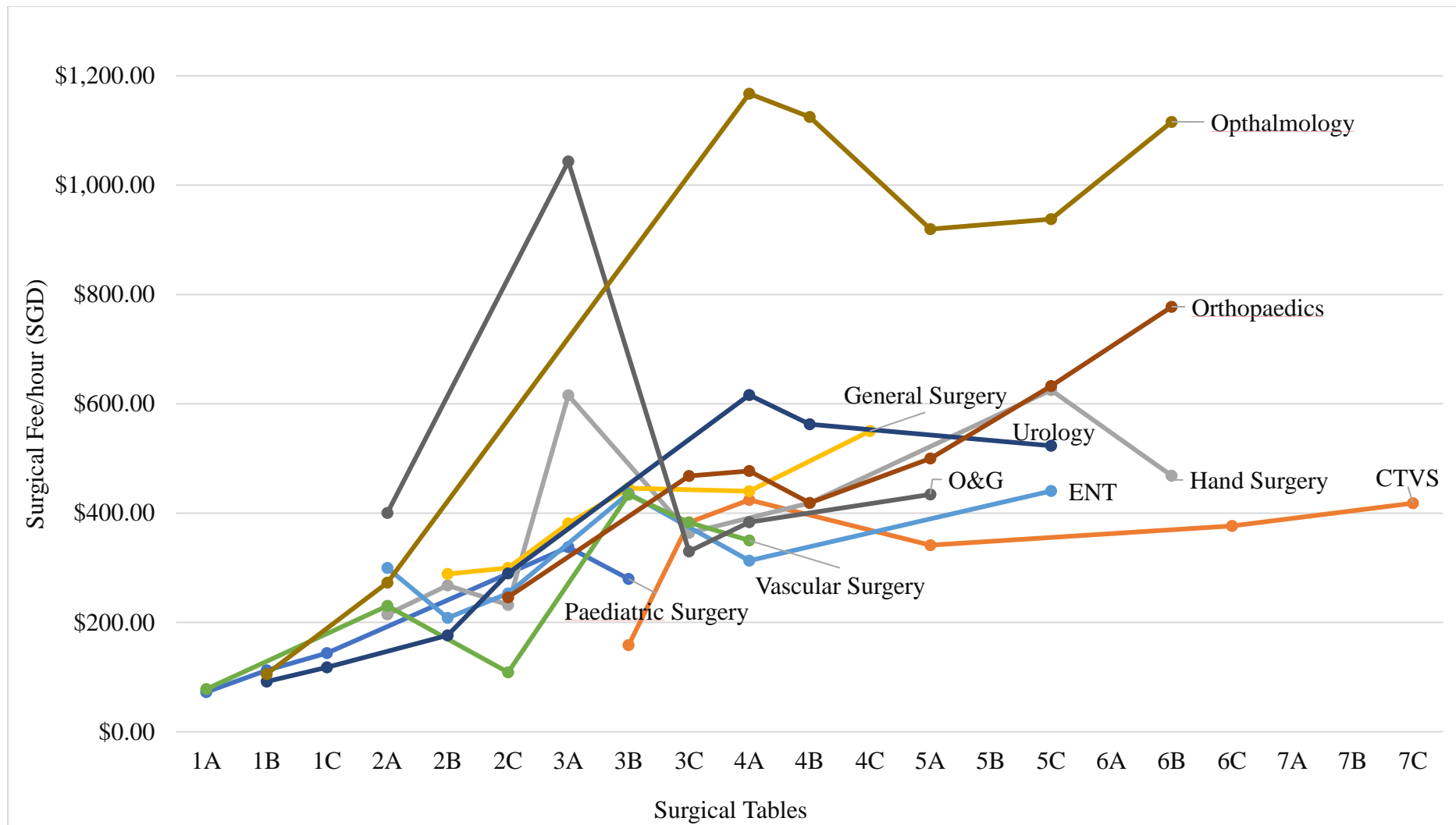


Figure 3. Surgical Fee/Hour by Surgical Table across Specialities

APPENDIX

Supplementary Table 1 Top operations performed in the fields of Cardiothoracic Surgery, Ear, Nose & Throat Surgery and General Surgery. Listed in each row are the names of the surgeries, the proportion of total surgical caseload contributed by that particular surgery (as a percentage in brackets), the Professional Fee (in SGD per hour) and the Surgical Table.

Speciality	Ranking by frequency of operation									
	1	2	3	4	5	6	7	8	9	10
Cardiothoracic Surgery	CABG, 3 or less vessels (19.7%) \$388.20/hr 6C	CABG, 4 or more vessels (10.10%) \$477.60/hr 7C	Valvular replacement (7.58%) \$365.40/hr 6C	Pneumectomy (3.54%) \$305.40/hr 5A	Exploratory thoracotomy (2.53%) \$158.40/hr 3B	Aortic root replacement with coronary reimplantation (2.53%) \$358.80/hr 7C	Pleurodesis (2.02%) \$211.20/hr 3C	Thorax, Tumour (mediastinal), Resection (2.02%) \$538.80/hr 5C	Intrathoracic Operation on Lungs/ Mediastinum (2.02%) \$224.40/hr 4A	Pneumonectomy /Lobectomy, Thoracoscopic (2.02%) \$316.80/hr 5B
Ear, Nose and Throat Surgery	Tonisillectomy with/without adenoidectomy (16.8%) \$464.40/hr 3B	Hemithyroidectomy (7.1%) \$287.40/hr 4A	Fronto-naso ethmoidectomy with/without sphenoidectomy (6.4%) \$426.00/hr 5C	Functional Sinusoscopic ethmoidectomy (6.2%) \$344.40/hr 4A	Myringoplasty (4.4%) \$308.40/hr 4A	Cervical LN excision biopsy (4.2%) \$256.80/hr 2C	Ear, pre-auricular sinus excision (3.3%) \$208.20/hr 2B	Superficial parotidectomy (3.1%) \$454.20/hr 5C	Grommett insertion with myringotomy (2.7%) \$249.60/hr 2A	Larynx and pharynx. laser application (2.4%) \$300.00/hr 3B
General Surgery	Lap/open cholecystectomy (9.65%) \$400.20/hr 4A	Haemorrhoidectomy (4.83%) \$327.00/hr 2C	Appendicectomy (3.36%) \$267.60/hr 3B	High anal fistula excision (2.69%) \$178.80/hr 2B	Anal fistulectomy (2.57%) \$288.60/hr 2B	Haemorrhoids, laser excision (2.44%) \$381.00/hr 3A	Bilateral herniorrhaphy (2.14%) \$550.20/hr 4C	Breast lump excision (1.95%) \$273.00/hr 2C	Unilateral herniorrhaphy (1.77%) \$336.60/hr 3B	Simple mastectomy and axillary clearance (1.71%). \$420.60/hr 5A

Supplementary Table 2 Top operations performed in the fields of Hand Surgery, Obstetrics & Gynaecology and Ophthalmology. Listed in each row are the names of the surgeries, the proportion of total surgical caseload contributed by that particular surgery (as a percentage in brackets), the Professional Fee (in SGD per hour) and the Surgical Table.

Speciality	Ranking by frequency of operation									
	1	2	3	4	5	6	7	8	9	10
Hand Surgery	Skin/subcutaneous wound debridement (29.11%) \$273.00/hr 2C	Hand, complex crush injurie wound debridement (11.97%) \$363.60/hr 3C	Hand, crush injuries debridement with repair /reconstruction (4.75%) \$625.20/hr 5C	Single Trigger finger release (3.54%) \$352.80/hr 2A	Radius and ulnar fracture, ORIF (2.97%) \$418.80/hr 4B	Skin tumor/cyst excision (2.90%) \$76.80/hr 1A	Hand closed fracture ORIF (2.9%) \$191.40/hr 2C	Bone (upper limb) plate and screw removal (2.41%) \$267.60/hr 2B	Carpal tunnel release (2.20%) \$615.60/hr 3A	Hand complex injuries microsurgical reconstruction (1.84%) \$468.60/hr 6B
Obstetrics & Gynaecology	Cervix Cone biopsy (30.94%) \$1043.40/hr 3A	Lower segment caesarian section (24.79%) \$483.00/hr 4A	Termination of pregnancy (14.25%) \$400.20/hr 2A	Ovarian Cystectomy (3.28%) \$287.40/hr 4A	Total hysterectomy +/- salpingo-ophorectomy (1.43%) \$311.40/hr 4A	Ectopic pregnancy, laparotomy (1.39%) \$340.20/hr 3B	Myomectomy, complicated (1.11%) \$434.40/hr 5A			
Ophthalmology	Cataracts extraction with IOL implantation, (62.57%) \$1162.80/hr 4A	Cataracts extracion with IOL and trabeculectomy (2.63%) \$970.80/hr 5A	Cataracts extraction with IOL implantation, paediatric (2.25%) \$1125.00/hr 4B	Retinal detachment, resection/buckling with plomb (2.16%) \$937.80/hr 5C	Cataracts, extracion with IOL and trabeculectomy with/without antimetabolites (1.69%) \$868.20/hr 5A	Pterygium removal with conjunctival graft (1.31%) \$273.00/hr 2A	Vitrectomy (2.35%) \$1116.30/hr 6B	Eye examination under anaesthesia (1.13%) \$105.60/hr 1B	Ectropion correction, Bilateral (1.13%) \$567.60/hr 4A	

Supplementary Table 3 Top operations performed in the fields of Orthopaedics Surgery, Paediatric Surgery, Urology and Vascular Surgery. Listed in each row are the names of the surgeries, the proportion of total surgical caseload contributed by that particular surgery (as a percentage in brackets), the Professional Fee (in SGD per hour) and the Surgical Table.

Speciality	Ranking by frequency of operation									
	1	2	3	4	5	6	7	8	9	10
Orthopaedics Surgery	Therapeutic arthroscopy (8.12%) \$477.00/hr 4A	Skin/subcutaneous tissue wound debridement (6.77%) \$246/hr 2C	Total knee replacement (5.42%) \$777.60/hr 6B	Shoulder acromioplasty (4%) \$499.80/hr 5A	Knee ligaments, reconstruction and repair (3.29%) \$588.00/hr 5C	Spine, corrective osteotomy. (3.29%) \$521.40/hr 7C	Reduction of fracture with plate fixation and fluoroscopy (2.77%) \$676.20/hr 5C	Ankle fracture, ORIF (2.26%) \$281.40/hr 3C	PID Chemo-nucleolysis (2.26%) \$654.60/hr 3C	Radius and ulnar fracture, ORIF (2.19%) \$418.80/hr 4B
Paediatric Surgery	Circumcision (10%) \$125.40/hr 1B	Intra-arterial infusion of neck/thorax/abdomen (8.87%) \$269.40/hr 3A	Removal of Arteriovenous shunt (5.5%) \$144.00/hr 1C	Unilateral herniotomy (5.5%) \$406.80/hr 3A	Appendicectomy (5.2%) \$226.20/hr 3B	Abscess, I & D/ Saucerisation (4.59%) \$92.40/hr 1A	Cystoscopy, with removal of stent (3.67%) \$461.40/hr 2C	Cryptorchidism, orchidopexy (2.75%) \$333.60/hr 3B	Insertion of central venous line (2.45%) \$52.80/hr 1A	Skin lesion, excision biopsy (2.14%) \$98.40/hr 1B
Urology	TURP <30gm (14.2%) \$562.80/hr 4B	Ureterscopy + laser lithotripsy (9.7%) \$575.40/hr 4A	Circumcision (7.88%) \$90.00/hr 1B	TURBT (4.85%) \$656.40/hr 4A	Hydrocelectomy /varicocelectomy (4.55%) \$176.40/hr 2B	Open Radical nephrectomy (4.24%) \$365.40/hr 5C	TURP>30gm (4.24%) \$681.00/hr 5C	Rigid Cystoscopy (3.03%) \$93.00/hr 1B	Vasectomy (3.03%) \$117.60/hr 1C	Cystoscopy with DJ stenting (2.42%) \$289.80/hr 2C
Vascular Surgery	Varicose vein ligation + stripping (44.14%) \$433.80/hr 3B	Varicose vein bilateral stripping + multiple ligations (17.2%) \$336.00/hr 4A	AVF creation (8.28%) \$382.80/hr 3C	Lower limb amputation (4.14%) \$407.40/hr 4A	AVF ligation (3.45%) \$230/40/hr 2A	Deep>3cm/ Extensive Contaminated Wound, Debridement (2.76%) \$108.60/hr 2C	Subcutaneous Tissue, Wound<3cm, Debridement (2.76%) \$78.00/hr 1A			