

Research Article

Assessment of Operative Experience of General Surgery Residents of Yekatit 12 Hospital Medical College, Addis Ababa, Ethiopia

Saron Alemayehu¹ , Surafel Mulatu¹ , Wondwossen Amtataw^{1,*} ,
Getabalew Endazenaw² 

¹Department of Surgery, Yekatit 12 Hospital Medical College, Addis Ababa, Ethiopia

²Department of Public Health, Yekatit 12 Hospital Medical College, Addis Ababa, Ethiopia

Abstract

Background: The Zwisch Score is a recognized tool for objectively assessing resident competency, particularly in measuring faculty guidance. However, there hasn't been a study in Ethiopia yet to assess surgical residents' operative experience using this standardized objective method. **Objective:** To assess the operative experience of general surgery residents' using Zwisch score in Yekatit 12 Hospital Medical College. **Methods:** A cross-sectional study design was employed, involving all general surgery residents enrolled in the residency program at Yekatit 12 Hospital Medical College from January 2020 to January 2023. Primary data collection utilized online shared questionnaires, with data entry and analysis conducted using SPSS. **Result:** In Yekatit 12 Hospital Medical College, there are 18 Surgeons and 44 surgery residents. Senior residents tend to give junior residents scores of show and tell (33.3% for year 1, 50% for year 2), while year 1 residents most commonly rate themselves as providing active help (18.4%), and year 2 residents rate themselves as show and tell (59.3%). When comparing senior residents' scores with their own, seniors commonly rate themselves as providing passive help (30% for year 3, 65.4% for year 4), and residents rate themselves similarly (31% for year 3, 62.1% for year 4). **Conclusion:** There are variations between scores given by junior residents and seniors, but senior residents' self-assessments align closely with those of the seniors. This suggests that residents tend to accurately evaluate their skills as they progress through their residency.

Keywords

Surgical Resident, Zwisch Score, Operative Experience, Resident Evaluation

1. Introduction

Surgical residency programs began in Germany in the late 1880s, later adopted by William Halsted in the US in 1889. Surgical education has evolved from exposure-based learning to structured curriculum. However, current discussions revolve around international concerns regarding work time

constraints [1-3]. Achieving sufficient operating volume and autonomy poses challenges for surgical residents. Each resident is expected to be actively involved and supervised during their operative experiences, maintaining a logbook monitored by the Department of Surgery education team to ensure

*Corresponding author: wossenamtataw@gmail.com (Wondwossen Amtataw)

Received: 2 April 2024; **Accepted:** 19 April 2024; **Published:** 14 June 2024



Copyright: © The Author(s), 2024. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

fulfillment of requirements [4-10].

Assessing surgical residents objectively is challenging due to their varied operating experiences. The Zwisch score standardizes this assessment, reliably measuring operative autonomy. It consists of four stages. Show and tell, Active help, Passive help, and supervision only, indicating levels of resident autonomy and surgeon involvement during procedures. This model offers precise evaluations, identifies strengths and areas for improvement, and sets procedure-specific expectations across different postgraduate year levels [11-17].

In Ethiopia Uniform, simple evaluation methods for surgical residents across the country are lacking and this study employed questionnaires to assess Procedural Autonomy and Supervision System, aiming to evaluate resident performance based on the Zwisch scale with minimal workflow disruption.

2. Method and Materials

2.1. Study Area and Study Period

This study is conducted in Y12HMC, general surgery department which is found in the centre of the Addis Ababa, Ethiopia. The study was carried out between Jan 2022 to May 2023.

2.2. Study Design

Cross sectional study was conducted on operative experience of general surgical residents attending residency program at Y12HMC.

2.3. Source and Study Population

All surgical residents of Y12HMC attending residency program from Jan, 2020 to Jan, 2023 were considered as source and study population.

2.4. Inclusion and Exclusion Criteria

All general surgery residents of Y12HMC attending residency program from Jan, 2020 to Jan, 2023 were included in the study where as general surgery residents from other Hospitals and attaching residents from other departments were excluded from the study.

2.5. Study Variables

Dependent variables-Operative experience.

Independent variables-Sex, Year of residency, Specialty, Type of procedure, Complexity of procedure.

2.6. Operational Definition

Operative experience- The level of surgical skill of resident on handling surgical procedures measured by Zwisch score.

Surgery- Medical specialty that uses operative manual and instrumental techniques on a person to investigate or treat a pathological condition.

Surgical Resident- A doctor who has completed medical school and in active training for surgical specialty.

Resident Evaluation- The act of forming an opinion of the amount, value or quality of resident's work or progress after careful follow up by the senior or by the resident him self.

Zwisch Score- scoring system used to evaluate Operative experience and Autonomy of Surgery resident in quantitative measure.

2.7. Data Collection and Quality Control

First training was given to the consultants and resident who were involved in the study. Data was collected using online questionnaires in English language. The questionnaires include questions about year of residency, the type of procedure done and Zwisch scoring of the surgical residents. The questionnaires were shared online to general surgical residents and the senior involved in the procedure after the end of each procedure in the OR and the questionnaires were filled in the OR, and the online filled questionnaires were collected by the data collector personnel. The principal investigator had ongoing supervision each day during data collection to ensure the quality of data by checking filled format for their completeness and consistency. And incomplete questionnaires are discarded.

2.8. Data Processing and Analysis

Once data completeness was ensured, it was inputted into SPSS Version 24 for analysis. Descriptive statistical methods were employed to ascertain frequencies, means, and standard deviations of both dependent and independent variables.

3. Results

There are 44 General surgery residents 11 in each year of residency from year one to year four in which 81.8% are male residents and 18.2% female residents. Eleven residents in each year of residency from year one to year four. There are 8 (18.2%) female surgical residents, two in each year of residency and 36 (81.8%) male residents (Table 1).

Table 1. Socio-demographic characteristics of general surgery residents of Y12HMC from January, 2020 to January, 2023.

Variable		Frequency	Percent
Sex	Male	36	81.8%
	Female	8	18.2%
Year of residency	PGY 1	11	25%
	PGY 2	11	25%
	PGY 3	11	25%
	PGY 4	11	25%
Age	< 30 years	14	31.8%
	≥30 years	30	68.2%

There are a total of 18 Surgeons including General Surgeon 8, Urologic surgeon 3, Neurosurgeon 3, HBP Surgeon 1, Pediatrics Surgeon 2, and Cardiothoracic Surgeon 1 (Table 2).

Table 2. Number of attending physicians in Y12HMC and their specialty.

Specialty	Number	Percent
General Surgeon	8	44%
Urologic surgeon	3	16.6%
Neurosurgeon	3	16.6%
Hepatobiliary Surgeon	1	5.5%
Pediatrics Surgeon	2	11%
Cardiothoracic Surgeon	1	5.5%
Total	18	100%

The common procedures done during the study were open cholecystectomy 25.1% followed by Laparoscopic cholecystectomy followed by thyroidectomy and tissue hernia repair 8.8% each.

Table 3. Frequencies of surgical procedures done at Y12HMC during the study period that are filled on the questionnaire.

Surgical procedures	Frequency	Percent
Thyroidectomy	13	8.8%
MRM	9	6.1%
Open Cholecystectomy	37	25.1%
Laparoscopic Cholecystectomy	15	10.2%
Mesh Repair	7	4.7%
Orchidopexy	9	6.15
PPV ligation	12	8.1%
Colon REEA	2	1.3%
Colostomy reversal	3	2%
Tissue Hernia repair	13	8.8%
Hemorrhoidectomy	2	1.3%
Others	25	17%

Based on Zwisch scale for residents the commonest score given by the senior for year 1 resident is 1 (show and tell) 10 (33.3%). For year 2 residents the commonest score given by the senior is also 1 (show and tell) 15 (50%). For year 3 and 4 residents the commonest score given is 3 (passive help) 16 (30%) and 34 (65.4%) consecutively (Table 4).

Table 4. Year of residency with Zwisch scale of senior Cross tabulation.

		Zwisch scale of senior				Total	
		1	2	3	4		
Year of residency	1	Frequency	10	1	0	0	11
		%	33.3%	2.4%	0.0%	0.0%	7.1%
	2	Frequency	15	13	2	9	39
		%	50.0%	31.7%	3.8%	28.1%	25.2%
	3	Frequency	1	11	16	8	36
		%	3.3%	26.8%	30.8%	25.0%	23.2%

		Zwisch scale of senior				Total
		1	2	3	4	
4	Frequency	4	16	34	15	69
	%	13.3%	39.0%	65.4%	46.9%	44.5%
Total	Frequency	30	41	52	32	155
	%	100.0%	100.0%	100.0%	100.0%	100.0%

From theZwisch score given by the residents for themselves the commonest score given by year 1 residents is 2 (active help) 7 (18.4%). The commonest score given by year 2 residents is 1 (show and tell) 16 (59.3%). For year 3 and 4 it is 3 (passive help) 18 (31%) and 36 (62.1%) consecutively.

Table 5. Year of residency with Zwisch scale of resident Cross tabulation.

		Zwisch scale of resident				Total
		1	2	3	4	
1	Frequency	4	7	0	0	11
	%	14.8%	18.4%	0.0%	0.0%	7.1%
2	Frequency	16	10	4	9	39
	%	59.3%	26.3%	6.9%	28.1%	25.2%
3	Frequency	2	8	18	8	36
	%	7.4%	21.1%	31.0%	25.0%	23.2%
4	Frequency	5	13	36	15	69
	%	18.5%	34.2%	62.1%	46.9%	44.5%
Total	Frequency	27	38	58	32	155
	%	100.0%	100.0%	100.0%	100.0%	100.0%

From tables 4 and 5 It's observed that comparison between senior and resident Zwisch score, when we see the score given by the senior to year 1 resident the commonest score is 1 show and tell (33.3%) but the score given by the residents for themselves the commonest score is 2 active help (18.4%). Comparison between senior score to year two resident the commonest score given by the senior is 1 show and tell (50%), the commonest score given by the year 2 residents to themselves is also 1 show and tell (59.3%). Comparison between senior and year 3 resident, the commonest score given by the senior is 3 passive help (30%) and the commonest score given by residents for themselves is also 3 passive help (31%). Comparison between senior and year 4 residents the commonest score given by the senior is 3 passive help (65.4%) and also the score given by the resident for themselves is 3 passive help (62.1%).

And also this study shows that the procedures given score of 4 observation only mostly are done by year 4 residents (46.9%), followed by year 2 resident (28.1%) and followed by year 3 residents (25%).

Most of the procedures encountered by year 4, year 3 and year 2resident are average (59.4%, 58.3% and 43.6% respectively) for year 1 residents most of the procedures encountered are easy 81.8% in this case it should be remembered that year 1 resident are involved in less complex surgeries which is described below (Table 6).

Tabulation shows that none of year 1 residents are given major t. And the commonest role for year two resident is as assistant resident (37.9%), for year 3 and year 4 residents the commonest role on surgical procedure is operating resident (28.1%) and (56.2%) respectively.

Table 6. Procedure Complexity Scale filled by Senior * Year of residency Cross.

			Year of residency				Total
			1	2	3	4	
Procedure Complexity Scale filled by Senior	Average	Frequency	2	17	21	41	81
		%	18.2%	43.6%	58.3%	59.4%	52.3%
	Difficult	Frequency	0	8	4	9	21
		%	0.0%	20.5%	11.1%	13.0%	13.5%
	Easy	Frequency	9	14	11	19	53
		%	81.8%	35.9%	30.6%	27.5%	34.2%
Total	Frequency	11	39	36	69	155	
	%	100.0%	100.0%	100.0%	100.0%	100.0%	

Table 7. Year of residency and Role of resident Cross tabulation.

			Role of resident		Total
			Assistant Resident	Operating Resident	
Year of residency	1	Frequency	11	0	11
		%	16.7%	0.0%	7.1%
	2	Frequency	25	14	39
		%	37.9%	15.7%	25.2%
	3	Frequency	11	25	36
		%	16.7%	28.1%	23.2%
	4	Frequency	19	50	69
		%	28.8%	56.2%	44.5%
	Total	Frequency	66	89	155
		%	100.0%	100.0%	100.0%

The commonest procedure year 1 resident involved in from this study is PPV ligation (45%) followed by Orchi-dopexy (27.3%), The commonest procedure year 2 resident involved in from this study is Open cholecystectomy (25.6%) followed by laparoscopic cholecystectomy (23.1%) then PPV ligation (12.8%). The commonest procedure year 3 resident involved in from this study is open cholecystectomy (38.1%) followed by thyroidectomy and

hernia tissue repair 11.1% each. The commonest procedure year 3 resident involved in from this study is open cholecystectomy (18.8%) followed by Thyroidectomy (15.8%) followed by MRM (10%). The commonest procedures done by residents as operating resident are Open cholecystectomy (32.6%), Tissue repair (14.6%), MRM (9%), Thyroidectomy (6.7%) (Table 8).

Table 8. Procedure Name * Year of residency Cross tabulation.

	Year of residency				Total
	1	2	3	4	
Anatrophic Lithotomy				1.4%	0.6%
CBD Exploration				1.4%	0.6%
Chest tube insertion	9.1%				0.6%
Colostomy Reversal				4.3%	1.9%
Cystolithotomy			2.8%		0.6%
Debridement				1.4%	0.6%
FA Excision				1.4%	0.6%
Fistulectomy				1.4%	0.6%
Heller's Myotomy				1.4%	0.6%
Hemi thyroidectomy				2.9%	1.3%
Hemorrhoidectomy				2.9%	1.3%
Hydrocelectomy		2.6%			0.6%
Hypospadias Repair	9.1%		5.6%		1.9%
Ileostomy Reversal				1.4%	0.6%
Lap Cholecystectomy		23.1%	2.8%	7.2%	9.7%
Lipoma Excision		2.6%		1.4%	1.3%
MBR				4.3%	1.9%
Mesh Repair		5.1%		7.2%	4.5%
MRM	9.1%		2.8%	10.1%	5.8%
Multiple Ligation			2.8%		0.6%
Neck Mass Excision			2.8%		0.6%
NTT				1.4%	0.6%
Open Cholecystectomy		25.6%	38.9%	18.8%	23.9%
Orchiectomy		2.6%	2.8%		1.3%
Orchidopexy	27.3%	7.7%	8.3%		5.8%
Positive Margin Excision Post M		2.6%			0.6%
PPV Ligation	45.5%	12.8%	5.6%		7.7%
Pyloromyotomy				1.4%	0.6%
REEA				2.9%	1.3%
Roux en Y Choledochojejunostomy				1.4%	0.6%
Roux en Y cystojejunostomy		2.6%			0.6%
Roux en Y Hepaticojejunostomy				1.4%	0.6%
RtHemi colectomy				1.4%	0.6%
STT				1.4%	0.6%
Thoracotomy and Bullectomy		2.6%			0.6%
Thyroid Lobectomy				2.9%	1.3%

	Year of residency				Total
	1	2	3	4	
Tissue Repair		7.7%	11.1%	4.3%	6.5%
Tracheostomy and Esophagostomy			2.8%		0.6%
TT			11.1%	7.2%	5.8%
TVP				2.9%	1.3%
UCF Repair		2.6%			0.6%
Varicose Vain Stripping				1.4%	0.6%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

4. Discussion

This study shows the commonest score given by the senior to year 1 resident is 1, show and tell (33.3%) but the score given by the residents for themselves the commonest score is 2, active help (18.4%). Comparison between senior score to year two resident the commonest score given by the senior is 1 show and tell (50%), the commonest score given by the year 2 residents to themselves is also 1 show and tell (59.3%).

Comparison between senior and year 3 & 4 resident, the commonest score given by the senior is 3, passive help (30%) & (65.4%) and the commonest score given by residents for themselves is also 3, passive help (31%) & (62.1) respectively, so we can analyze that most of year 1 residents over estimate their surgical skill compared to the senior's observation. For year two residents even though the highest score is the same compared with the senior the percentage of the score of the residents to score given by the senior is little bit higher so we can realize that some of year two residents over estimate their surgical skill compared the senior which is similar in some way to the finding in the study done at Northwestern University, Chicago, Illinois on which shows Resident and faculty expectations of resident operative autonomy were similar. For laparoscopic cholecystectomy, residents expected significantly more autonomy than the faculty did during the junior years but they agreed with the faculty for the chief year [13].

This finding is also similar to the result found on study done on Springfield, Massachusetts, USA which shows extremely close agreement on acceptance of credit (n=1,049 of 1,139; p < 0.00001); where disparity existed, it was predominant in the first two postgraduate years (62% of 90 cases) [18].

This result is opposite to the finding on Study done at Harvard Medical School, Massachusetts General Hospital 46% trainees and faculty performance ratings were discrepant ($r = 0.47$), with 80% residents rating themselves lower

than faculty in those cases [12].

The commonest procedure done on this study is open cholecystectomy 25.1% followed by Laparoscopic cholecystectomy followed by thyroidectomy and tissue hernia repair 8.8% each which is somehow comparable with the results found on Study done at Northwestern University, Chicago, Illinois The 10 most common procedures which include Laparoscopic cholecystectomy, Laparoscopic appendectomy, Open inguinal hernia, Wide local excision melanoma, Morbid obesity procedures, Hemorrhoidectomy, Thyroidectomy/parathyroidectomy, Laparoscopic partial colectomy, Simple excision soft tissue mass, Umbilical hernia accounted for 56.3% (827) of the cases [13].

Most of the procedures encountered by year 4, year 3 and year 2 resident are average (59.4%, 58.3% and 43.6% respectively) for year 1 residents most of the procedures encountered are easy 81.8% in this case this result is comparable for year 2 residents to the result found on the study done on Springfield, Massachusetts, USA in 2007, which shows Sixty-five percent of procedures in the intermediate group were performed by first or second postgraduate year residents, in which this result is opposite for our year 1 residents [18].

This study shows through experience the residents analyze their actual experience and they are becoming more experienced on analyzing themselves.

From this study we can conclude that the responsibilities through different year of residency are appropriately distributed and senior residents are trained to be more independent and to handle procedures by themselves.

This study also shows the junior resident are being more exposed to laparoscopic surgery than the senior resident this shows that the advancement of Y12HMC surgical department on training surgical residents through the years.

5. Conclusion

Year 4 residents mostly receive observation-only scores,

followed by year-two and year-three residents respectively. Senior residents commonly score junior residents as "show and tell" while year-one residents rate themselves as "active help" and year-two residents rate themselves as "show and tell". Seniors most often score themselves as providing "passive help", similarly, residents rate themselves likewise. Year 4, year 3, and year 2 residents mostly encounter average procedures 59.4%, 58.3%, and 43.6% respectively, while year 1 residents encounter mostly easy procedures (81.8%).

Abbreviations

CBD	Common Bile Duct
EC	Essential Common
EU	Essential-Uncommon
FACS	Fellow of the American College of Surgeons
FB	Fellow Bound
GI	Gastrointestinal
GS	General Surgery
GYN/OBS	Gynecology and Obstetrics
HERQA	Higher Education Relevance and Quality Agency
IP	Index Procedure
MD	Medical Doctor
MRM	Modified Radical Mastectomy
OR	Operating Room
PGY	Post graduate Year
QE	Qualifying Examination
REEA	Resection and End to End Anastomosis
SCORE	Surgical Council on Resident Education
TV	Truncal Vagotomy
UK	United Kingdom
USA	United States of America
Y12HMC	Yekatit 12 Hospital Medical Collage

Ethical Approval and Consent to Participants

Ethical clearance was obtained from the Institutional Review Board of Y12HMC (Protocol number 049/23; dated: 17/03/2022). Permission and written consent was taken from the college management. The information gained from the patients upon data collection was kept confidential by using codes for each card throughout the study. The procedures followed were by the ethical standards of the Helsinki Declaration.

Acknowledgments

We, the authors acknowledge all individuals involved in the comprehensive management of the patient. Furthermore, our gratitude extends to the administration of Yekatit 12

Hospital Medical College for granting permission to access and utilize the patients' medical records in the preparation of this article.

Funding

There is no fund for this research article.

Data Availability Statement

All data supporting the case report is available with the crosspondance.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Camison, L., et al., The history of surgical education in the United States: past, present, and future. *Annals of Surgery Open*, 2022. 3(1): p. e148.
- [2] Richmond, B. K., Everything Old is New Again: Applying the Lessons from Halsted's Life and Work to Today's Surgical Landscape. *The American Surgeon*, 2022. 88(7): p. 1405-1410.
- [3] Puliatti, S., et al., Training and Challenges to Perform Robot-Assisted Renal Surgeries, in *Robotic Urologic Surgery*. 2022, Springer. p. 421-426.
- [4] Bart, M., J. Breuer, and A. L. Freier, *Atlas der Datenkörper 1: Körperbilder in Kunst, Design und Wissenschaft im Zeitalter digitaler Medien*. 2022: transcript Verlag.
- [5] Sierra-Sierra, S., L. C. Domínguez, and L. Torregrosa-Almonacid, Operative experience of general surgery residents: Results of a cross-sectional multinstitutional study in Colombia. *Revista Colombiana de Cirugía*, 2021. 36(3): p. 411-420.
- [6] Lonergan, P. E., et al., Analysing the operative experience of basic surgical trainees in Ireland using a web-based logbook. *BMC medical education*, 2011. 11: p. 1-8.
- [7] Yu, Y., et al., General Surgery Resident Complement and Operative Autonomy—Size Matters. *Journal of Surgical Education*, 2022. 79(6): p. e76-e84.
- [8] Mobilio, M. H., et al., Struggles with autonomy: Exploring the dual identities of surgeons and learners in the operating room. *The American Journal of Surgery*, 2020. 219(2): p. 233-239.
- [9] Woelfel, I., et al., Residents' method for gaining operative autonomy. *The American Journal of Surgery*, 2020. 220(4): p. 893-898.
- [10] Williams, R. G., et al., A proposed blueprint for operative performance training, assessment, and certification. *Annals of surgery*, 2021. 273(4): p. 701-708.

- [11] George, B. C., et al., Reliability, validity, and feasibility of the Zwisch scale for the assessment of intraoperative performance. *Journal of surgical education*, 2014. 71(6): p. e90-e96.
- [12] Kendrick, D. E., et al., The reliability of resident self-evaluation of operative performance. *The American Journal of Surgery*, 2021. 222(2): p. 341-346.
- [13] Meyerson, S. L., et al., Defining the autonomy gap: when expectations do not meet reality in the operating room. *Journal of surgical education*, 2014. 71(6): p. e64-e72.
- [14] Torres, M. B., P. M. Quinones, and M. Sudarshan, Assessing resident autonomy: what tools are available. *Bull Am Coll Surg*, 2018. 103(8): p. 46-52.
- [15] Deal, S. B., et al., Crowd-sourced and attending assessment of general surgery resident operative performance using global ratings scales. *Journal of Surgical Education*, 2020. 77(6): p. e214-e219.
- [16] Almufarrej, F., L. Lentz, and N. Guillermina, 6. Assessing the Validity and Reliability of the Zwisch Scale in Plastic Surgery Residency. *Plastic and Reconstructive Surgery–Global Open*, 2021. 9(2S): p. 3-4.
- [17] Zhou, N. J., et al., Preoperative briefings and postoperative debriefings to increase resident operative autonomy and performance. *Journal of surgical education*, 2021. 78(5): p. 1450-1460.
- [18] Coe, N. P., et al., Evaluation of the accuracy of reporting residents' operative experience. *The American Journal of Surgery*, 1990. 159(6): p. 615-618.