

Student Experiences in Third-year Hospital Internship Using Logbook Records

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ABSTRACT: **Objective:** This study aimed to evaluate whether third-year medical students' clinical internship met educational objectives and to assess students' perceptions of their clinical experience. **Methods:** A mixed-methods, descriptive, observational study was conducted with third-year medical students at Lisbon School of Medicine. Students logged their clinical activities using a digital logbook and completed a survey assessing their satisfaction with their supervisor and respective department, skills development, and overall experience. Descriptive statistics were used for quantitative analysis, while qualitative feedback was thematically categorized. **Results:** Of the 369 participating students, 99.5% completed the digital logbook, documenting their clinical activities. The data revealed strong engagement in core clinical procedures, with cardiovascular, pulmonary, and abdominal examinations performed by over 85% of students. In contrast, exposure to the neurological, musculoskeletal, and genital-urinary systems was significantly lower, ranging from 26% to 64%. Participation in key procedural and communication skills varied significantly, with participation in writing patient charts by 54% and communication of bad news recorded by only 25% of students. While survey responses indicated high satisfaction with the overall learning experience, variations in specialty exposure and procedural opportunities emerged as areas for improvement. **Significance:** Students demonstrated strong engagement in core clinical procedures and reported high satisfaction, but gaps in training for specific systems, communication skills, and hands-on training were identified. Addressing these disparities can enhance clinical education and improve alignment with curricular objectives.

KEY WORDS: Medical education, clinical rotation, student experience, digital logbook, curriculum alignment.



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INTRODUCTION

Medical education requires the ability to integrate theoretical knowledge with clinical practice, yet the transition from classroom learning to bedside training presents challenges for both students and educators^[1, 2]. To bridge this gap, it is essential that the medical curriculum continuously evolves, incorporating diverse teaching strategies that enhance clinical reasoning and procedural skills, but also promote student autonomy and provide constructive feedback and emotional support^[3, 4]. These elements are closely tied to student motivation. When a student recognizes the practical relevance of their learning activities and feel confident in their ability to complete them, they are more likely to excel academically and clinically^[4].

Clinical rotations play a pivotal role in medical training, as they offer an opportunity to cultivate this motivation, by allowing students to practice their skills and make important decisions in real-patient scenarios^[5, 6]. However, when students are assigned to various hospitals under the supervision of different tutors, it can be challenging to ensure they receive consistent learning opportunities to develop these essential skills, an issue which has also been described by Schick et al. regarding the final year of undergraduate medical education in Germany^[7].

To assess whether all students meet the core curriculum's clinical objectives, it is essential to document their learning activities systematically^[8]. The use of logbooks becomes particularly useful in this setting, as they allow for supervision and monitoring of students' clinical work and for supervisor feedback, contributing overall to improving medical teaching^[9, 10].

This study aims^[1] to analyse students' first clinical experience and assess whether it aligns with the educational objectives set by the curriculum, and^[2] to evaluate students' overall perception of their hospital rotation experience.

METHODS

Study Design

This study is a mixed-methods, descriptive, observational study incorporating prospective data collection and survey elements.

Educational Context and Curriculum Overview

Lisbon School of Medicine's 6-year master's pro-

gram covers three years of theory (physiology, anatomy, pathophysiology) and three years of clinical rotations for hands-on experience.^[11]

The course "Introduction to Clinical Practice" during third year consists of theoretical and practical classes, where students learn the basics of history taking and physical examination. This course is finished with a four-week clinical rotation intended as a bridge between pre-clinical and clinical training. This internship allows students to practice essential clinical competencies, while gaining practical experience with basic procedures, such as venous and arterial blood punctures.

Students are placed in various hospital departments under different supervisors, primarily around Lisbon. Supervisors are medical doctors with a financial connection to FMUL but are not necessarily part of the academic career. They are invited to an optional online meeting to clarify the goals and details of the clinical rotation, with the same information also provided by email. The clinical internship's primary goal is the completion of three individual case histories up to the initial diagnostic hypotheses, guided and evaluated by the tutor. Secondary objectives include integrating students into hospital practice, fostering teamwork, professional interactions, and patient-centred care. Students are expected to go beyond passive observation by actively participating in clinical activities under supervision. This includes history-taking and physical examinations, and accompanying tutors in emergency care, consultations, ward rounds, and clinical meetings.

Participants

The participants in this study were 369 third-year medical students from FMUL who were undertaking their clinical internships at various hospitals, primarily in the Lisbon region, during the 2023–2024 academic year. A detailed list of these hospitals can be found in Appendix A. Each student was assigned to a specific hospital department and to a supervisor for the four-week duration of their internship. This internship represented their first clinical rotation, providing an initial hands-on experience in medical practice. Additionally, students were using the Logbook App (Xerpa®) for the first time, integrating it into their workflow to document activities and monitor progress.

Data Collection

Data was collected using a mobile application

(Xerpa®), which served as a digital logbook (Appendix B) for students to document their daily clinical experiences. Filling out the logbook was mandatory, but non-compliance did not impact on students' evaluation. At the end of each day, students recorded the following information:

- **Core Clinical Procedures:** Students logged specific clinical tasks they performed, such as history taking, physical examinations, and basic procedures (e.g., venous and arterial punctures).
- **Frequency of Procedures:** Every time a student performed a clinical procedure, they were required to log it in the app, enabling the calculation of an average per student.
- **Additional Procedures (Free Text):** Students could document any additional procedures or clinical activities they observed or performed, using free text for unstructured input.

The app's data provided both quantitative information (frequency of core procedures) and qualitative insights (free-text entries and supervisor feedback).

At the internship's end, students completed an online survey (Appendix C) assessing:

- **Supervisor Engagement:** Support and guidance received.
- **Skill Development:** Opportunities to practice clinical procedures.
- **Recommendation Likelihood:** Willingness to recommend supervisor, department, and hospital.
- **Integration & Learning Satisfaction:** Ratings on team integration, learning quality, and digital logbook use (Likert scale 1–5).

Data Categorization

Data from the digital logbook was organized in Excel, grouping 72 Core Clinical Procedures by specialty. Free-text entries were categorized (e.g., surgeries, teaching sessions) to standardize varied descriptions. Survey feedback was also themed into positive (mentorship, learning) and negative (lack of support, limited practice) categories. For a detailed breakdown of this process, consult appendix D.

Data Analysis

The analysis was divided into quantitative and qualitative components:

Quantitative Analysis:

- **Descriptive Statistics:** Frequencies and averages

were calculated for each core clinical procedure to assess common activities and exposure levels. Students' final grades were also analysed statistically. In Portugal, we use a 0-20 grading scale, being 0 equivalent to 0% and 20 equivalent to 100%.

Qualitative Analysis:

- **Analysis of Additional Procedures:** Free-text entries on additional procedures were grouped into predefined categories based on recurring themes to identify clinical tasks outside the core curriculum.
- **Survey Response Analysis:** Structured responses to the survey questions were analysed to calculate the frequency of answers (e.g. "Yes", "No", "Maybe").
- **Feedback Analysis:** Positive and negative feedback was categorized to highlight recurring themes, with multi-category responses included in all relevant themes.

Ethical Considerations

Informed consent was electronically obtained when the students logged in the app and answered the survey. All identifiers were removed by the app as the data was exported to Excel.

RESULTS

1. Clinical Activities Logged by Students

A total of 367 students (99.5% of the total) reported their clinical activities performed during the clinical rotation in the digital logbook. Table 1 presents the detailed breakdown of activities within each category. The most frequent tasks included **hand hygiene** (10 times/student; 80% of all students) and **taking complete clinical histories** (5 times/student), with over 95% participation in history-taking. Skills like **cardiac auscultation** (6 times/student) and **pulmonary auscultation** (6 times/student) were widely practiced, with over 85% student involvement. **Writing patients charts** (4 times/student) was only registered by about half of the students (54%). Participation in more complex or specialized procedures, such as **arterial blood gas assessments** (3 times/student) and **digital rectal examinations** (3 times/student), was less frequent, with less than 50% participation. Overall, task frequency and participation varied significantly across systems and

TABLE 1. Overview of core clinical activities logged by students

Physical examinations and Procedures	Number of Students	Percentage of all students (%)	Total of Performed Procedures	Average Frequency per Student
GENERAL TASKS				
Hand hygiene	293	79.84	3044	10
Hand disinfection technique	249	67.85	2102	8
Taking complete clinical history	352	95.91	1808	5
Discussion of main clinical diagnostic hypothesis	335	91.28	1789	5
Discussion of differential diagnosis based on clinical findings	315	85.83	1493	5
Patient rounds	259	70.57	1439	6
Participation in writing of patient charts	199	54.22	799	4
Participation in selecting additional diagnostic resources based on clinical findings	190	51.77	670	4
Obtain informed consent (oral/written)	159	43.32	540	3
Participation in Interview of patient family members	100	27.25	265	3
Participation in bad news transmission	91	24.80	176	2
CARDIOVASCULAR SYSTEM				
Cardiac auscultation	330	89.92	2069	6
Evaluation of arterial pulses	314	85.56	1189	4
Assessment of blood pressure	258	70.30	1033	4
Assessment of peripheral perfusion signs	255	69.48	803	3
Assessment of lymph nodes	259	70.57	770	3
Evaluation of cardiac thrill	156	42.51	432	3
Evaluation and interpretation of apical impulse	145	39.51	363	3
THORAX AND LUNGS				
Lung auscultation	312	85.01	1742	6
Inspection of thorax	302	82.29	1236	4
Assessment of respiratory rate	300	81.74	1160	4
Assessment of breathing pattern	253	68.94	917	4
Assessment of difficulty breathing signs	196	53.41	613	3
Percussion of anterior, posterior and lateral thoracic walls	215	58.58	542	3
Assessment of chest expansion	191	52.04	499	3
Assessment of tactile fremitus	155	42.23	372	2
Per-oral auscultation	66	17.98	140	2
Auscultation transmitted voice sounds	62	16.89	135	2
NERVOUS SYSTEM				
Evaluation of higher cognitive functions	235	64.03	754	3
Assessment of cranial nerves III, IV, VI	239	65.12	668	3
Assessment of cranial nerve VII	224	61.04	631	3
Assessment of muscular strength - general strength	207	56.40	583	3
Assessment of muscular strength - segmental strength	202	55.04	562	3
Assessment of cranial nerve II	213	58.04	560	3
Assessment of cranial nerve V	210	57.22	554	3
Assessment of cranial nerve XII	194	52.86	508	3
Assessment of muscular tonus	182	49.59	497	3
Assessment of sensitivity	182	49.59	461	3
Assessment of vestibulocerebellar function	178	48.50	432	2
Assessment of cranial nerve XI	175	47.68	428	2
Assessment of cranial nerve IX and X	163	44.41	410	3
Assessment of cranial nerve VIII	160	43.60	387	2

TABLE 1. (continue)

Physical examinations and Procedures	Number of Students	Percentage of all students (%)	Total of Performed Procedures	Average Frequency per Student
NERVOUS SYSTEM				
Assessment of deep tendon reflexes	133	36.24	334	3
Evaluation of meningeal signs	138	37.60	302	2
Evaluation of lasègue's sign	133	36.24	297	2
Assessment of cutaneous reflexes	103	28.07	229	2
Evaluation of Babinski sign	109	29.70	221	2
ABDOMEN				
Inspection of abdomen	312	85.01	1448	5
Palpation of abdomen	302	82.29	1248	4
Percussion of abdomen	289	78.75	1083	4
Auscultation of bowel sounds	292	79.56	1079	4
Assessment of irritation peritoneal signs	202	55.04	615	3
Evaluation of fluid wave sign	176	47.96	419	2
Evaluation of renal Murphy sign	106	28.88	195	2
MUSKULOSKELETAL SYSTEM				
Assessment of wrist and hand joints	153	41.69	492	3
Gate assessment	173	47.14	417	2
Assessment of knee joint	140	38.15	398	3
Assessment of elbow joint	140	38.15	378	3
Assessment of ankle joint and foot	131	35.69	378	3
Assessment of shoulder joint	136	37.06	375	3
Assessment of spine	141	38.42	334	2
Assessment of hip joint	113	30.79	305	3
Assessment of sacroiliac joints	104	28.34	268	3
GENITAL - URINARY SYSTEMS				
Inspection and palpation of the breast	95	25.89	216	2
Inspection of perianal area and digital rectal examination	29	7.90	84	3
HEAD				
Assessment of oropharynx	175	47.68	460	3
Palpation of perinasal sinuses	161	43.87	333	2
Inspection of the nose and nasal fossae	143	38.96	309	2
Inspection and palpation of the ear and otoscopy	99	26.98	225	2
PROCEDURES				
Interpretation of patient radiographs	217	59.13	751	3
Recording and interpretation of ECG	161	43.87	475	3
Arterial blood gas collection	131	35.69	361	3

procedures.

Table 2 contains the categorized activities students engaged in outside of the core curriculum, reported as free-text entries.

Students participated in various activities outside the core curriculum, with 45% observing or practicing specialty-specific techniques/procedures (2 times/student) and 32% observing surgeries (1 time/student). Other notable activities included “ambulatory consult observations” (6%, 3 times/student) and “physical examinations outside the core curriculum” (11%, 2 times/student). This last category titled “Physical Examinations Outside the Core Curriculum” was created to encompass a variety of assessments that were not explicit in the logbook, such as “Evaluation of Pemberton Sign” and “Palpation of the Thyroid Gland.” Less frequent activities included minor surgeries (3%, 2 times/student), and participation in surgeries (3%, 1 time/student).

2. The Online Survey

A total of 225 students (61% from total) responded to the final online survey, with key findings summarized in Table 3. The majority felt supported by their supervisor during clinical history-taking (89%) and would recommend their hospital (91%) or department (86%) to colleagues, but 26% reported spending more than half of their rotation with another doctor besides their supervisor. Additionally, 56% had opportunities to train procedures, but fewer (28%) were able

to share clinical information directly with patients or relatives. These results highlight both positive aspects and areas for improvement in the internship experience.

The highest satisfaction was with welcome, friendliness, and integration (mean 4.6, SD 0.7) – Table 4. Learning opportunities and clinical skills training were also well-rated, with a mean score of 4.3 (SD 1.0). However, satisfaction with the Xerpa App and logbook was lower, with a mean score of 3.4 (SD 1.1), indicating potential areas for improvement in the digital tools provided for the rotation.

Positive and negative feedback were analysed and are illustrated in Fig. 1 and Fig. 2, respectively. A total of 127 (35% of total) students provided positive feedback, with 52% highlighting an ‘Enriching Learning Experience’ as the most significant aspect of their rotation, followed by 24% who emphasized a ‘Collaborative Team Environment.’ Conversely, 84 students (23% of total) reported negative experiences, with the most frequently cited issues being ‘Skill Development Gaps’ (37%) and ‘Limited Clinical Variety’ (17%). Regarding the Xerpa app, some negative comments were found that might explain the lower satisfaction (supplement IV).

3. Student's Final Grades

The mean and median of students grades for the clinical rotation was 19, revealing that the students con-

TABLE 2. Activities outside the core curriculum logged by students

Activities outside the core curriculum	Number of Students	Total of performed procedures	Average Frequency per student	Percentage of all students (%)
Observation/Practicing of techniques/procedures specific to specialty	166	298	2	45
Observation of surgeries	118	169	1	32
Physical examinations outside core curriculum	39	97	2	11
Observation of ambulatory consults	21	62	3	6
Observation/participation in clinical teaching session	20	23	1	5
Minor Surgery	12	28	2	3
Observation of emergency room shifts	12	31	3	3
Participation in surgeries	11	15	1	3
Venous punctures	9	24	3	2
Assessment of peripheral edema	9	44	5	2
Observation of department meetings	8	29	4	2
Observation of MDT meetings	5	10	2	1

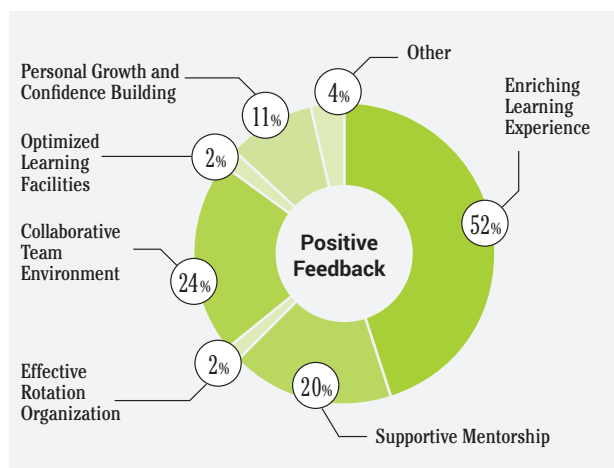
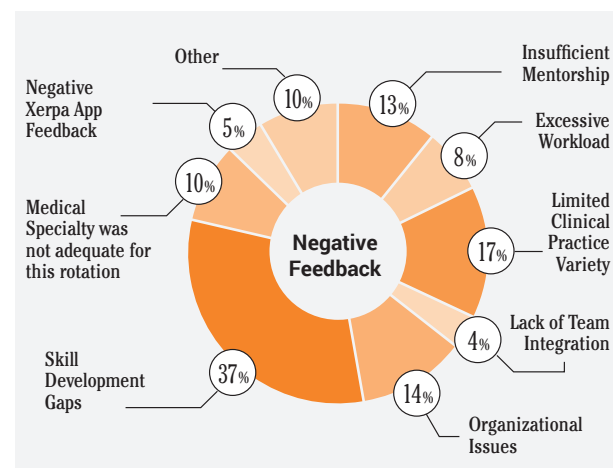
TABLE 3. Survey responses on student experiences and supervisor support

Questions	Yes	No	Maybe	Not answered
Other than your supervisor, were you with another doctor more than 50% of the rotation?	59 (26%)	164 (73%)	2 (1%)	0
Did you feel supported by your supervisor when taking Clinical Histories?	201 (89%)	16 (7%)	8 (4%)	0
Did you have the opportunity to train procedures (venous and arterial blood punctures, etc)?	127 (56%)	87 (39%)	9 (4%)	2 (<1%)
Did you have the opportunity to share clinical information with patients and relatives yourself?	62 (28%)	151 (67%)	11 (5%)	1 (<1%)
Were you asked to write patient clinical journals?	61 (27%)	157 (70%)	6 (3%)	1 (<1%)
Would you recommend your supervisor to your colleagues?	186 (83%)	13 (6%)	25 (11%)	1 (<1%)
Would you recommend you department to your colleagues?	194 (86%)	16 (7%)	14 (6%)	1 (<1%)
Would you recommend the hospital to your colleagues?	204 (91%)	7 (3%)	13 (6%)	1 (<1%)

TABLE 4. Mean satisfaction scores, standard deviations, and interpretations of clinical rotation experience

Questions	Mean Score	Standard Deviation
On a scale of 1 to 5, how satisfied are you with the welcome, friendliness, and integration in the department?	4.6	0.7
On a scale of 1 to 5, how satisfied are you with the learning opportunities and training in clinical skills?	4.3	1.0
On a scale of 1 to 5, how satisfied are you with the Xerpa App and logbook for this clinical rotation?	3.4	1.1

NOTE: Ratings were measured on a Likert scale from 1 ("Very dissatisfied") to 5 ("Very satisfied").

FIGURE 1. Distribution of positive feedback themes provided by students, shown as percentages**FIGURE 2.** Distribution of negative feedback themes provided by students, shown as percentages

sistently obtained high grades in their rotations.

DISCUSSION

This study aimed to evaluate the first clinical experience of 3rd-year medical students and assess whether it aligns with the educational objectives set by

the curriculum, as recorded in their digital logbook. Specifically, we assessed whether students' clinical training across diverse hospitals and supervisors provided consistent learning experiences that met the expected competencies. Additionally, the study sought to evaluate students' overall perception of their hospital rotation

experience, including levels of satisfaction, engagement in core clinical tasks, and perceived challenges.

Our findings highlight strong engagement in core clinical procedures, such as cardiovascular, pulmonary and abdominal examinations. However, they also reveal gaps in exposure to the physical examination of specific organ systems (e.g., neurological and musculoskeletal and genital-urinary systems) and in the development of communication skills. While students reported high satisfaction with their learning experience, specific areas – such as limited opportunities for hands-on procedural training and variation in specialty exposure – emerged as points for improvement.

The adherence rate to the digital logbook was remarkably high with 99.5% of students documenting their clinical activities, possibly allowing for a valuable overview of the activities practiced by the students.

The third-year rotation aimed to develop autonomous history-taking. Students were expected to write three histories followed by their discussion, but averaged five, exceeding curriculum goals. Though mandatory, only 95% logged it, likely due to underreporting, as all students fulfilled this requirement.

“General Tasks” comprehended activities that are universal to all specialties or that concern soft skills. The most logged activities were “Hand hygiene” and “Hand disinfection technique” reported by 80% and 68% of students, respectively. However, considering the fundamental importance of these activities, it is surprising that the participation level was not 100%, raising several topics for discussion. One possible explanation is underreporting, given the self-reported nature of our data collection. Additionally, previous studies have highlighted that student compliance with hand hygiene protocols has remained suboptimal, often due to gaps of knowledge regarding proper techniques and the lack of recognition of its importance in infection control.^[12-14] Moreover, research has shown that trainees are heavily influenced by their role models, yet many senior physicians fail to consistently adhere to hand hygiene protocols, inadvertently setting a poor example for students.^[15] Given these findings, and as suggested by available literature, repetitive hand hygiene training should be implemented into the curriculum, incorporating that both practical training and mechanisms to monitor its effectiveness, while also emphasizing the importance of positive role modelling by supervisors.^[13, 15]

In contrast, “Participation in Bad News Trans-

mission” was the least practiced activity, with only 25% students recording it. This limited involvement likely comes from the complexity and sensibility required for this task, which may be challenging for students still midway through their training.^[16, 17] In fact, patient communication, particularly bad news transmission, is primarily taught later in our school’s curriculum, possibly limiting students’ ability to participate in real-life patient interactions where this skill is required. As reported in other studies, many medical students report feeling underprepared for delivering bad news due to a lack of structured training, with existing curricula often relying on inconsistent teaching methods.^[18]

Additionally, some supervisors may be reluctant to involve junior colleagues in these conversations, as they themselves view them as emotionally distressing and may fear that the presence of inexperienced colleagues could worsen the situation.^[19] However, many patients express dissatisfaction with how doctors communicate bad news, which further highlights the need for improved education in this area and early involvement of students.^[20, 21]

Despite being a recommended clinical activity, student engagement in “Writing Patient Charts” under supervision, was low (54%). Gliatto et al. recognised the importance of students documenting patient encounters to develop essential skills in clinical reasoning and communication.^[22] However, institutional barriers such as liability concerns and added workload for supervisors may limit student involvement. (22, 23) This reluctance, coupled with the fact that this is students’ first clinical rotation, may contribute to the low participation observed. Similar findings in Germany suggest that students are less frequently given responsibility for patient documentation compared to the U.S. (24). To address this, we propose incorporating specific objectives into the rotation to encourage supervised student participation.

Standard physical examinations of “Thorax and Lungs”, such as inspection, auscultation or assessment of respiratory rate, had high levels of engagement, while other traditional examinations like “Per-oral auscultation” or “Auscultation of transmitted voice sounds” proved more limited, as they might end up being replaced by modern technology.^(25, 26) However, despite clinicians’ beliefs that clinical imaging is a more accurate diagnostic tool than physical examination, evidence suggests otherwise. In fact, detecting changes on auscultation of voice sounds – such as those

seen in pneumonia - revealed to be more consistently recognized by different clinicians than abnormalities detected on chest radiography, reinforcing the importance of preserving these techniques in modern teaching.^[27] "Per-oral auscultation", on the other hand, is a technique not commonly described in physical examination textbooks. For this reason, its inclusion in the core curriculum could be reconsidered.

Neurological, musculoskeletal, and genital-urinary exams did not exceed 65% participation, likely due to their specificity and varied clinical settings our students were placed in. As this was students' first clinical experience, future rotations will provide further training.

Regarding procedures, arterial blood gas collection was performed by very few students. This low participation rate is likely due to the greater time required for training and teaching this technique during clinical rotations. Nonetheless, practicing these procedures was not one of the main objectives of this internship, but more a complementary activity.

The assessment of activities outside the core curriculum highlights areas for potential improvement and revision of both the Student Logbook and the curriculum, ensuring that essential clinical skills are adequately emphasized in medical training. For instance, the category "Assessment of peripheral edema" was recorded by only a few students. However, this activity is considered significant enough to warrant inclusion in a future version of the Student Logbook due to its fundamental importance and routine use in clinical wards, as it is seen in a multitude of conditions.^[27, 28]

The response rate for the survey, while significantly lower than logbook adherence, still offers valuable insights into students' perceptions of their clinical experience. The moderate participation may be attributed to several factors, including survey fatigue, the perception that feedback would not lead to meaningful change, or a lack of personal incentive to complete the survey.^[29, 30]

Most students interacted exclusively with their assigned supervisor for the greater part of the rotation. This continuity likely facilitates meaningful feedback and enables supervisors to effectively monitor students' progress and skill development over time. The positive impact of sustained mentorship during clinical rotations has been well-documented in the literature, including studies such as Thistlethwaite et al.^[31]

Similarly, the quality of supervision is closely

tied to the supervisor's ability to balance providing students with adequate autonomy while offering necessary support for their tasks.^[32, 33] In our study, this balance was reflected in the high levels of perceived support, with nearly 90% of students reporting feeling supported when taking clinical histories.

This study offers valuable insights, but several limitations should be acknowledged. Using a self-reported digital logbook may have led to inconsistencies, affecting data accuracy. Subjective feedback and categorization could introduce interpretation bias. Additionally, students may have downplayed past challenges after receiving high final evaluations.

This study was instrumental in refining and reassessing the clinical skills and techniques outlined in the curriculum, ensuring they align with students' learning needs. Additionally, our findings could serve as a basis for comparing different medical education approaches in institutions using similar logbook systems, both nationally and internationally, contributing to the progressive improvement of medical training.

Qualitative feedback revealed that some students felt their assigned medical specialty was not ideally suited to the rotation's educational objectives, raising the question of whether certain specialties provide a more conducive learning environment. The low participation in musculoskeletal, neurological, and genitourinary examinations may reflect this misalignment. Future studies could assess how different specialties contribute to core competencies, allowing for a more strategic allocation of students and optimizing their clinical experience.

Further research could explore whether these early learning gaps persist throughout medical training, whether simulation or AI-assisted teaching could complement clinical exposure, and how different educational models impact skill acquisition. Additionally, enhancing supervisor engagement in practical teaching and documentation could maximize students' hands-on involvement. Addressing these aspects would contribute to create a more structured and effective medical education, ensuring the progressive development of essential clinical competencies.

To conclude, this study demonstrated students' strong engagement in core clinical procedures and high satisfaction. However, gaps in specialty exposure, communication skills, and hands-on training in medical routines and procedural skills were identified, highlighting opportunities for improvement to ensure a more comprehensive clinical education.

SUPPLEMENTARY FILES

Appendix A – List of Available Hospitals and Departments

Hospital	Specialty/Department	Number of available spots
Beatriz Ângelo	General Surgery	10
	Internal Medicine	14
	Gastroenterolgy	8
Forças Armadas	Internal Medicine	28
Arrábida - Setúbal	Internal Medicine	6
	General Surgery	8
Institute of Oncology (IPO)	Head and neck surgery	2
	General Surgery	12
Garcia de Horta	Vascular Surgery	6
	Reumatology	4
	Nephrology	2
	Maxilo-facial Surgery	2
	Cardiology	4
Cascais	Internal Medicine	4
Fernando da Fonseca	Neurology	4
	Infecciology	6
	Nephrology	4
	Gastroenterolgy	10
	Internal Medicine	20
	Stroke Unit	8
Santa Maria	Cardiology	16
	General Surgey	24
	Gastroenterolgy	4
	Dermatology	6
	Paediatrics	12
	Vascular Surgery	10
	Anesthesiology	6
	Stomatology	2
	Emergency Medicine	2
	Nephrology	6
	Endocrinology	6
	Internal Medicine	16
	Reumatology	4
	Pneumology	8
Lusíadas	Orthopaedic Surgery	10
	General Surgery	2
	Intensive Medicine	2
	Internal Medicine	6
CUF Descobertas	Orthopaedic Surgery	2
	Anesthesiology	2
	General Surgery	2
Luz Lisboa	Internal Medicine	6
	Gastroenterolgy	2
	Pneumology	6
	General Surgery	6
Portuguese Institute of Reumatology	Reumatology	10
Luz Setúbal	Internal Medicine	2
Barreiro-Montijo	Internal Medicine	6
	General Surgery	2
Santarém	Reumatology	2
Oeste	Internal Medicine	2
Aveiro	Reumatology	2

Appendix B – Original Clinical Logbook

	Logbook	n*
Geral	Aplicação da higienização das mãos	
	Aplicação da técnica de desinfecção das mãos	
	Anamnese e colheita de história clínica	
	Discussão das principais hipóteses diagnósticas	
	Discussão do diagnóstico diferencial com base em achados clínicos	
	Acompanhamento da equipa médica na visita clínica (se aplicável)	
	Colaboração no registo médico eletrónico	
	Colaboração na seleção dos MCDTs indicados a suportar as hipóteses diagnósticas	
	Consentimento informado (oral e/ou escrito)	
	Colaboração na entrevista a familiares	
Sistema Cardio-vascular	Colaboração na comunicação de más notícias	
	Cardíaco - Auscultação cardíaca	
	Geral - Avaliação dos sinais de perfusão capilar	
	Geral - Avaliação de cadeias ganglionares linfáticas	
	Cardíaco - Pesquisa de frémito	
	Cardíaco - Avaliação e interpretação do impulso apical/choque da ponta	
	Vascular - Palpação e descrição do pulso arterial	
Sistema Respiratório	Vascular - Medição da pressão arterial	
	Auscultação dos sons pulmonares e ruídos adventícios	
	Inspeção do tórax	
	Avaliação da frequência respiratória	
	Avaliação do padrão respiratório	
	Deteção de sinais de dificuldade respiratória	
	Percussão da parede torácica anterior, posterior e lateral	
	Avaliação da expansibilidade torácica	
	Avaliação das vibrações vocais	
	Auscultação per-oral	
Sistema Neurológico	Auscultação da voz	
	Avaliação das funções nervosas superiores	
	III, IV e VI - Oculomotores	
	VII - Facial	
	Avaliação da força muscular - Global	
	Avaliação da força muscular - Segmentar	
	II - Ótico	
	V - Trigémio	
	XII - Hipoglosso	
	Avaliação do tónus muscular	
	Avaliação da sensibilidade	
	Avaliação das funções vestibulo-cerebelosas	
	XI - Espinhal	
	IX e X - Glossofaringeo e vago	
	VIII - Acústico	
	Avaliação de reflexos - Ósteo-tendinosos	

	Pesquisa de sinais meníngeos	
	Pesquisa do Sinal de Lasègue	
	Avaliação de reflexos - Cutâneos	
	Pesquisa do Sinal de Babinsky	
Sistema Digestivo	Inspeção do abdômen	
	Palpação da parede abdominal	
	Percussão da parede abdominal	
	Auscultação dos ruídos hidroaéreos	
	Avaliação de sinais de irritação peritoneal	
	Pesquisa do Sinal da Onda líquida	
	Pesquisa do Sinal de Murphy renal	
Sistema Músculo-esquelético	Avaliação das articulações do punho e mão	
	Estudo da marcha	
	Avaliação da articulação do joelho	
	Avaliação da articulação do cotovelo	
	Avaliação da articulação do tornozelo e pé	
	Avaliação da articulação do Ombro	
	Avaliação da Coluna vertebral	
	Avaliação da articulação coxo-femoral	
	Avaliação das articulações sacro-iliacas	
Sistema genito-urinário	Inspeção e palpação mamária	
	Inspeção perianal e toque retal	
Cabeça	Avaliação da orofaringe	
	Palpação dos seios perinasais	
	Inspeção do nariz e das fossas nasais	
	Inspeção e palpação do ouvido e otoscopia	
Técnicas/pequenos gestos	Avaliação de radiografia simples	
	Execução e interpretação de eletrocardiograma	
	Gasimetria arterial	
Outras Atividades	Texto livre	

* n = Número total de procedimentos realizados

Appendix C – Online Survey (translated to english)

Dear students,

With this brief anonymous questionnaire, we aim to gather informal feedback regarding your satisfaction and learning experience during your internship.

All questions are optional, including those about your tutor, department, and hospital. However, when relevant, we kindly ask you to identify at least the department/hospital to help us better assess the internship experience across different institutions.

Any individual results that could identify a tutor, department, or hospital will remain strictly confidential and accessible only to the course administration.

We appreciate your responses by **July 31**.

Thank you!

- Hospital where the internship was conducted
- Department where the internship was conducted
- Name of the official tutor
- Besides your official tutor, did you spend more than 50% of your internship with another doctor?
 - ☐ Yes (please specify at the end if you believe this doctor should be invited as an official tutor)
 - ☐ No
 - ☐ Other: _____
- Did you feel supported in conducting clinical histories?
 - ☐ Yes
 - ☐ No
 - ☐ Other: _____
- Did you have the opportunity to perform minor procedures (e.g., venous blood collection, blood gas analysis, etc.)?
 - ☐ Yes
 - ☐ No
 - ☐ Maybe
- Did you have the opportunity to provide clinical information to patients' family members?
 - ☐ Yes
 - ☐ No
 - ☐ Maybe
- Were you responsible for entering electronic medical records?
 - ☐ Yes
 - ☐ No
 - ☐ Maybe
- Satisfaction with the team's reception, friendliness, and integration
 - ☐ Very poor 1 2 3 4 5 Excellent
- Satisfaction with the knowledge and clinical skills acquired during the internship
 - ☐ Very poor 1 2 3 4 5 Excellent
- Would you recommend your tutor to your colleagues?
 - ☐ Yes
 - ☐ No
 - ☐ Maybe
- Would you recommend the department where you interned to your colleagues?
 - ☐ Yes
 - ☐ No
 - ☐ Maybe
- Would you recommend the hospital where you interned to your colleagues?
 - ☐ Yes
 - ☐ No
 - ☐ Maybe
- Satisfaction with the Xerpa application and internship logbook
 - ☐ Not satisfied 1 2 3 4 5 Very satisfied
- Positive aspects of your internship: _____
- Negative aspects of your internship: _____

SUPPLEMENTARY FILES

Appendix D – Data categorization

The data from digital logbook was exported to Microsoft Excel for organization and analysis. A total of 72 Core Clinical Procedures were grouped into categories based on their corresponding medical specialties. Additional procedures, recorded as free-text entries by students, were consolidated into distinct categories, such as observation or participation in surgeries, or participation in teaching sessions (table D.1).

This categorization was necessary because students often described similar experiences using varied language, leading the app to register them as separate entries. For instance, all observations of ambulatory consultations, regardless of specialty, were grouped under “Observation of Ambulatory Consultations.” The same approach was applied to other experiences, such as surgeries, teaching sessions, and meetings. This process ensured consistency and improved the clarity of the data, enabling a more accurate analysis of students’ activities during the internship.

Regarding the survey analysis, positive and negative feedback (table D.2 and table D.3) regarding the rotations, collected as free-text entries, were also categorized into distinct themes for the same reason. Positive feedback was grouped into themes such as mentorship, learning experience, and team-integration, while negative feedback was categorized into themes such as lack of supervisor support, limited clinical variety, or lack of hands-on practice.

Table D.1 – Categorization of activities outside the curriculum

Activities outside the core curriculum	Example entry
Observation/ practicing of techniques/ procedures specific to specialty	“Observation of endoscopic procedures”; “I helped ventilate the patient”
Observation of surgeries	“Watched mamma surgery”; “Watched cataract surgery”
Physical examinations outside core curriculum	“Palpation of the testicles”; “Assessment of Pemberton sign”
Observation of ambulatory consults	“Participation in mamma oncology consults”; “I was in cardiology consults”
Observation/ participation in clinical teaching session	“I watched a clinical session on oesophageal rupture”
Minor surgery	“I helped with minor surgery procedures”
Observation of emergency room shifts	“I went to the ER with my supervisor”
Participation in surgeries	“I scrubbed in a testical torsion surgery”
Venous punctures	“I practiced venous punctures”
Assessment of peripheral edema	“I assessed peripheral edema”
Observation of department meetings	“I watched department meetings”
Observation of MDT meetings	“I was in MDT meetings for oncology patients”

Note: Free text entries that not met any of these categories was removed as it was considered to be very low frequency and not relevant for the objectives of the study.

Table D.2 – Categorization of Positive Feedback

Category of positive feedback	Example Comments
Enriching Learning Experience	“I got to test my own knowledge with the help of my tutor on a patient’s bedside”
Supportive Mentorship	“I learned a lot with my Tutor, who was always available to help”
Effective Rotation Organization	“They were very flexible with the scheduling”
Collaborative Team Environment	“The whole department was very welcoming and always explained what was going on”
Optimized Learning Facilities	“The hospital was calm which allowed for a better learning experience”
Personal Growth and Confidence Building	“I was given autonomy within the limitations of still being a student”
Other	“The hospital was close to my home”

Table D.3 – Categorization of Negative Feedback

Category of negative feedback	Example Comments
Insufficient Mentorship	“We didn’t have a lot of support... our tutor never had any time”
Excessive Workload	“The rotation was too long”
Limited Clinical Practice Variety	“I was only in consultations and only observing”
Lack of Team Integration	“A lot of times we were left alone without any guidance”
Organizational Issues	“My tutor had to many students as many assigned tutor had left on holidays”
Skill Development Gaps	“I didn’t get to practice any procedures of the logbook”
Medical Specialty was not adequate for this rotation	“[the speciality] is too specific for 3rd year students”
Negative Xerpa App feedback	“I don’t understand the need to use Xerpa”
Other	“It was hard to get to the hospital without a car”, “The evaluation was not fair compared to others”

Other Comments regarding the use of Xerpa:

“As there was a separate category called “clinical histories” I thought I was supposed to put the information gathered through the 3 histories. For me and my colleague it wasn’t clear that we had to write notes on the different patients we observed. Only at the end of the internship. We suggest for future years this information is clearer.”

“Registering [clinical histories] in Xerpa does not help with this rotation. Since we must fill out the information about the patients as we talk with them, it does not a good impression to be using the phone.”

CONFLICT OF INTERESTS:

The authors have no conflict of interests to declare.

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