Teaching and Learning and Self-Assessment in Nuclear Hospital (NH) versus Affiliated (AH) Hospitals Surgical Clerkship in the 6th year of the Faculty of Medicine - Oporto University (FMUP) (Analysis of 913 students)

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ABSTRACT

Background: the increasing of the numerus clausus becomes difficult to perform surgical clerkship (6th year) in just one hospital. So it became necessary to have the collaboration of Affiliated Hospitals (AH). This research corresponds to the comparative analysis of that clerkship in those institutions.

Methods: A voluntary and anonymous assessment was conducted by 913 (49.3%) of the 1851 students who attended surgical clerkship in the school years 2007-2008 to 2013-2014 in Oporto Medical School. Surveys were collected corresponding to the student's assessment of "teaching-learning" and "self-assessment", valued in a Likert scale from 1 to 5; surgical training and the perspectives for future specialization were equally assessed, before and after the clerkship. Results from the Nuclear Hospital (NH) vs AH were compared.

Results: In the comparative analysis of the NH vs AH there was a similar assessment of teaching-learning and self-assessment; however, concerning teaching-learning, several items received a higher rating in AH than in the NH: clinical training in outpatient center (3.80 vs 3.67 $p=0.029$), emergency (4.02 vs 3.91 $p=0.043$) and operating room (3.78 vs 3.62 $p=0.024$). Self-assessment in the NH was slightly worse than in the AH, regarding the use of training opportunities (4.34 vs 4.41 $p=0.058$).

Conclusion: Assessment of the item "teaching and learning" proved to be superior in AH regarding clinical training in outpatient center, operating room and emergency. It must be considered that the collaboration of AH in the Surgical Clerkship of the 6th year students is a valid and effective alternative.

Abbreviations: NH – Nuclear Hospital (HSJ – Hospital de S. Jojo); AH – Affiliated Hospitals; FMUP – Faculty of Medicine, Oporto University

Key words: Medical education, Surgical Clerkship, Affiliated hospitals, Oporto Medical School

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BACKGROUND

There has been, in recent years, a radical change in medical education

essentially after Flexner report (1). The old rigid system, with almost exclusive appreciation for theoretical concepts was replaced by a system which appreciates practical aspects, placing students at the heart of problem solving related to the patient and based on the critical development of their cognitive attitudes (2,3,4). It has been equally valued the interconnection between curricular units of basic sciences and clinical, encouraging research, and more recently transforming the last year of the course in a year directed to clinical practice.

These goals gain particular emphasis on the pedagogical methodology provided to students of the 6th year, whose preparation constitutes the bridge between university and the future residency (5).

However, it is essential to evaluate the efficiency and the degree of satisfaction of those students at the end of the 6th year.

Eyal (6) refers: "the necessity of gathering information from students and graduates to evaluate their medical education experience" and various publications reveal that not always the results are satisfactory. Thus, Chen (7) in a Harvard University research, in 2015, based on 2287 surveys conducted in 107 American universities, reports that only 53.8% of students considered themselves well prepared for the exercise of future residency. Similarly, Jaili (8) verified that 70% of students did not believe to be sufficiently trained in clinical skills for the future practice of medicine.

In this context, FMUP, whose organization of undergraduate education is well-defined in UP information platform (5) has sought to provide 6th year students a vocational education, preparing them for future tasks of clinical life bringing them into contact with different specialties and hospitals (9,10,11).

Regarding surgical clerkship, besides general surgery, partial clerkships in various surgical areas are provided by FMUP, according several medical schools, namely: general surgery, vascular, cardiothoracic, pediatric, plastic and reconstructive surgery, experiencing various sectors including the emergency department and the experimental surgery lab (12,13,14,15,16).

However, giving the continuous numerus clausus increase it has become difficult, concerning general surgery, to successfully perform this clerkship in just one hospital (NH) and, for this reason, from 2005-2006 the collaboration of several AH was required, considering positive experiences regarding the extension of medical education to other hospitals in addition to the nuclear as well as following decisions taken by FMUP similarly to what happened in some universities (17).

It is, therefore, necessary to evaluate in detail, the efficiency of this methodology, comparing the results obtained in the NH (HSJ) with AH, which is the aim of our research, through surveys answered by students, over eight successive years.

METHODS

The universe of this study consists of 1851 students (*table 1*). We collected a sample of 913 students (49.3%) that voluntarily responded to an anonymous survey after attending to the surgical clerkship (6th year) at FMUP, in the school years from 2007-2008 to 2013-2014. There were 305 students were from the NH (Hospital São João) and 608 from AH (V. N. Gaia Hospital Centre - CHVNG, Hospital Padre Américo, Hospital Pedro Hispano - HPE, in Matosinhos, Central Hospital of Funchal and Hospital Divino Espírito Santo - in Ponta Delgada) (*table 2*).

Table 1 - Distribution of students by nuclear hospital

School Year	Number of students enrolled in the 6th year	Number of students who completed the Integrated Master in Medicine
2007	183	183
2008	198	198
2009	242	236
2010	239	227
2011	260	242
2012	275	261
2013	242	230
2014	288	274
Total	1927	1851
%	47.4%	49.3%

Table 2 - Distribution of students by hospitals

			Year								Total
			2007	2008	2009	2010	2011	2012	2013	2014	
Hospital	NH	N	38	26	26	30	43	51	51	40	305
		%	4.2%	2.8%	2.8%	3.3%	4.7%	5.6%	5.6%	4.4%	33.4%
	AH	N	67	47	63	63	85	100	117	66	608
		%	7.3%	5.1%	6.9%	6.9%	9.3%	11.0%	12.8%	7.2%	66.6%
	Total	N	105	73	89	93	128	151	168	106	913
		%	11.5%	8.0%	9.7%	10.2%	14.0%	16.5%	18.4%	11.6%	100.0%

At the beginning of the clerkship a Log Book is distributed to all students, equal in all hospitals, where all activities are recorded (some mandatory), and subsequently validated by tutors, through which frequency is assessed and attributed much of the clerkship evaluation.

This clerkship includes 4 weeks in general surgery in NH and AH and 1 week in each of the other surgical specialties only in NH (pediatric surgery, vascular, cardio-thoracic, plastic and reconstructive). A short stay in the experimental surgery lab (FMUP) was included in the period of general surgery. Each student or group of 2 was mentored by one tutor (surgeon). The Director of Surgical clerkship was in permanent contact with hospitals, having organized regular meetings both with students, at the beginning and end of clerkship, and with those responsible for their medical education, in order to monitor training as well as final assessments.

At the end of each clerkship, all students voluntarily return an anonymous survey corresponding to the assessment of teaching-learning, self-assessment, general surgery training and future career prospects. In the group corresponding to teaching-learning, 14 items were considered with 5 possible answers, valued in a Likert scale (1-very poor, 2-poor, 3-fair, 4-good, 5-very good). Self-assessment group considers 5 possible answers (1-not at all, 2-slightly, 3-sufficient, 4-very, 5-completely). The global surgical assessment was evaluated in (1-very poor, 2-poor, 3-good, 4-excellent). The results related to each item as well as the comparative analysis of the results obtained in the NH (HSJ) and in AH were globally evaluated. These surveys are distributed to all students simultaneously with the Logbook (10).

Statistical data analysis was performed using IBM SPSS Statistics, v.22. Observed and expected frequencies were compared using the Chi-square Test and the differences between groups were assessed using the Mann-Whitney Test. Reliability Analysis (Internal

Consistency Analysis and Factor Analysis) was performed to assess the instrument used in this study. Significant values were considered for $p < 0.05$.

RESULTS

Teaching and learning assessment (table 3)

Items with average rating above "Good" are related to Overall impression (4.14), Support of teachers (4.10), Appropriate duration (4.09), Overall organization (4.05) and Consistency of the program objectives (4.03). Items related to learning style and Staff meetings have a lower average rating (3.54 and 3.49, respectively).

Teaching and learning assessment according to institutions (table 4)

Students from the NH and from AH made an

Table 3 - Teaching and learning assessment

	N	Average	Standard Deviation
Overall impression	909	4.14	0.59
Support from teachers	902	4.10	0.78
Appropriate duration	907	4.09	0.85
Overall organization	909	4.05	0.69
Consistency of the program objectives	900	4.03	0.74
Clinical training (Emergency)	910	3.98	0.93
Availability of other professionals	899	3.88	0.81
Clinical training (Wards)	910	3.83	0.87
Assessment methodology	890	3.77	0.88
Clinical training (Outpatient Center)	908	3.75	0.81
Clinical training (Operating Room)	910	3.72	0.99
Other pedagogical activities	847	3.72	0.89
Learning Style	876	3.54	0.86
Staff meetings	904	3.49	0.90

Table 4 - Teaching and learning assessment according to institutions

	NH			AH			p
	N	Average	Standard Deviation	N	Average	Standard Deviation	
Overall impression	304	4,12	0,59	605	4,15	0,59	0,453
Global organization	303	4,09	0,65	606	4,03	0,71	0,387
Support teachers	302	4,15	0,77	600	4,08	0,78	0,230
Clinical training - Jobs	304	3,85	0,82	606	3,82	0,90	0,790
Clinical training - Outpatient Center	302	3,67	0,81	606	3,80	0,81	0,029
Clinical training - Emergency	304	3,91	0,91	606	4,02	0,93	0,043
Clinical training - Operative room	305	3,62	1,01	605	3,78	0,98	0,024
Other educational activities	282	3,70	0,84	565	3,72	0,92	0,581
Staff meetings	303	3,56	0,84	601	3,45	0,92	0,078
Learning styles	297	3,63	0,78	579	3,50	0,89	0,079
Availability of other professionals	300	3,84	0,75	599	3,89	0,84	0,210
Appropriateness to the objectives and program	303	4,02	0,74	597	4,04	0,73	0,896
Duration of suitability	304	4,09	0,83	603	4,10	0,86	0,701
Assessment methodology	300	3,79	0,88	590	3,76	0,88	0,571

identical average evaluation of teaching and learning on most items (probative values of over 0.05). However in the items related to Clinical training in the OR, Outpatient Center and Emergency department, the evaluation was lower in NH than in AH (probative values of 0.024, 0.029 and 0.043, respectively).

Self-Assessment

Items related to Use of training opportunities and Involvement in care tasks are valued above "Very", with average values of 4.38 (sd=0.63) and 4.29 (sd=0.68), respectively. The item related to Collaboration in pedagogical activities has an average value of 3.98 (sd=0.76), slightly below that level.

Self-assessment according to institutions

NH students assess themselves slightly worse than students from other institutions in the item related to Use of training opportunities (4.34 sd=0.62 vs 4.41 sd=0.63), with a difference that, although not statistically significant, is on the border line ($p=0.058$). In the other two items, self-assessment is identical.

Comparison of teaching and learning and self-assessment areas

Both self-assessment and the assessment of teaching and learning (in a scale of 0 to 1) is positive, with the first one having a higher average value (0.805 sd=0.138) than the second (0.718 sd=0.125).

Comparison of teaching and learning and self-assessment areas according to institutions

NH students and students from AH self-assess themselves (in a scale from 0 to 1) identically (0.803 sd=0.131 vs 0.806 sd=0.141) ($p=0.492$) and assessed, also identically, teaching and learning (0.715 sd=0.120 vs 0.716 sd=0.128) ($p=0.787$). In both cases the self-assessment values are higher than the assessment of teaching and learning.

Global surgical training

Considering all of the students, 84% assessed their global surgical training as good or excellent. For NH students this percentage is 84.6%, and in AH is 83.7%.

Future career perspectives

Before clerkship, 57.8% of students had the perspective of performing a medical specialty, 41.0% a surgical specialty and 20.0% intended to be general practitioners.

In a global way, the perspectives in terms of career that students had prior to clerkship remained very similar to those after its completion. It is noteworthy, however, a 6.4% increase favouring the surgical specialty option, and a decrease of 2.7% in the general practitioners option and 2.3% in medical specialty.

Future career perspectives according to institutions

In this item, there were no significant differences before and after clerkship in NH and AH, except in the perspective of choosing a surgical specialty that increased slightly in the NH in relation to AH.

Reliability analysis

Internal consistency analysis: teaching and learning assessment (table 5)

Internal consistency analysis resulted in a 0.866 Cronbach's alpha for the teaching and learning dimension, and a 0.708 alpha for the self-assessment dimension. This shows a good internal consistency of the instrument used in this study. In table 4 we present the corrected item-total correlations and alpha values considering the exclusion of each item.

Factor analysis (table 6)

We retained two main components in teaching and learning dimension that explain 46% of the accumulated variance. One is related to clinical teaching and the other related to assessment and curricular units' organization. On self-assessment dimension we retained three main components (corresponding to the three items in that dimension), which explains 100% of the accumulated variance. The following table shows the matrix components related to the teaching and learning dimension.

DISCUSSION

Assessing student's skills for medical performance

Table 5 - Internal Consistency Analysis: Teaching and Learning Assessment

	Corrected Item-Total correlations	Alpha if Item is excluded
Teaching and Learning Assessment		
Overall impression	0.655	0.853
Overall Organization	0.579	0.855
Support from teachers	0.582	0.854
Clinical training - Ward	0.494	0.859
Clinical training – Outpatient Center	0.468	0.860
Clinical training - Emergency	0.456	0.861
Clinical training – Operating room	0.430	0.863
Other pedagogical activities	0.532	0.856
Staff meetings	0.510	0.858
Didactic resource	0.554	0.855
Availability of other professionals	0.555	0.855
Adequacy to the objectives and program	0.682	0.849
Appropriate duration	0.440	0.861
Assessment methodology	0.505	0.858
Self-assessment		
Involvement in care tasks	0.579	0.552
Collaboration in pedagogical activities	0.496	0.667
Use of training opportunities	0.515	0.635

at the end of the course is one of the major current concerns of those responsible for medical education.

Ours results are a clear evidence of the good preparation offered by FMUP to students of the 6th year in surgical clerkship. Regarding global dimension, the item teaching-learning registered an evaluation of good – 4 – in the following items: overall impression, support from teachers, appropriate duration, overall organization

Table 6 - Factor Analysis

Rotated Component Matrix ^a			
		Component	
		P < 0.001	P < 0.001
Clinical teaching	Clinical training – Operating room	0.686	
	Clinical training - Emergency	0.627	0.128
	Support from teachers	0.605	0.336
	Other pedagogical activities	0.596	0.256
	Clinical training – Outpatient center	0.585	0.177
	Overall impression	0.567	0.471
	Availability of other professionals	0.508	0.388
	Clinical training - Ward	0.436	0.375
	Staff meetings	0.422	0.411
	Appropriate duration	P < 0.001	0.752
Assessment and curricular units' organization	Assessment methodology	0.138	0.714
	Adequacy to the objectives and program	0.397	0.681
	Overall organization	0.350	0.604
	Didactic resources	0.326	0.577

and consistency with the program objectives. The values obtained in the items staff meetings and didactic resources were the lowest, according to what was mentioned in an earlier publication (15).

In self-assessment, there were higher average levels regarding the use of training opportunities and involvement in care tasks than in collaborative pedagogical actions.

The values obtained in the evaluation performed according Cronbach's alpha showed a good internal consistency of the instruments used in this study.

In our research it is very important to note that comparative analysis of student assessment concerning general surgery in the NH vs AH revealed no significant difference in teaching-learning, though higher in AH with respect to training in the operating room, outpatient center and emergency; similarly, there were no differences in the students self-assessment who did their clerkship in both types of hospitals, although the AH revealed better use of training opportunities. Both institutions revealed higher averages in self-assessment than in teaching-learning. Global surgical training was, in general, good or very good, not registering significant differences between the NH and AH, having both a similar result on this item. There are differences, although not significant, in choosing future medical careers, before and after clerkship.

The fact that the evaluation of the above items in the AH was not inferior to the NH, being even superior in some of them, is noteworthy; this should be probably related to the lower patient-student ratio in affiliated hospitals in that only the latter be teaching exclusively students of the 6th year; besides the tutors, in these latter, are residents that have started the participation in the medical education recently and probably have a greater motivation to demonstrate the capabilities of their department and hospital. This allows the AH to have greater availability of tutors, allowing greater personalization in the contact between students and patients, particularly in wards, outpatient center, operating room and emergency.

Thus, in wards, students had the opportunity to participate in daily visits to patients and organizing medical records, being necessary, in these cases, consent from patients for collaboration in teaching (18, 19); however, in AH they had more opportunities to perform small acts such as urinary catheterization, nasogastric intubations, venipunctures, and administration of parenteral solutions, as well as make dressings to surgical wounds.

In the operating room, besides contacting with professionals from various areas (multidisciplinary

team), they were confronted with the strict rules of behavior in this department. Students also had contact with aspects related to leadership of multidisciplinary teams, particularly in situations of stress, as sometimes occurs inside an operating room. There was an outspoken enthusiasm in relation to the various techniques of the several surgical specialties, particularly in general surgery and regarding minimally invasive surgery of which HSI was one of the pioneers in Portugal (20). However, the lower differentiation of some patients resorting to the AH, allowed a greater participation of students in the various surgical procedures, as aids, while under the guidance of their respective tutors.

The same happened in outpatient center, where there is the possibility to dialogue with patients in the pre and in the immediate postoperative care, besides contacting with a wide range of pathologies.

The stay through the emergency department was considered essential to the clinical experience of a surgical clerkship. Here, students contacted with critical situations of various kinds and in the convenient monitoring of emergencies.

They also had the opportunity to frequent the outpatient surgery area (21), analyzing indications and postoperative care inherent in the treatment of patients; however, it was more efficient in the AH than in the NH because of the vocation of the latter for more differentiated pathologies.

The experience in the experimental surgery lab, where they had the opportunity to perform minor surgical procedures and make sutures on models and small animals, is presented today with great relevance in medical education (16, 21, 22, 23); it was very helpful to all students, particularly those in the AH, since they had greater opportunity to practice the abovementioned sutures in the "emergency department", in the treatment of small wounds; these cases are more frequent the AH than in the NH, since the latter is oriented for more complex patients.

During clerkship, students were reminded of the importance of teaching-learning in problem solving (24), which is of particular interest, mainly in the performance of clinical tasks of the medical profession, as well as in the development of "learning styles" skills, internet, database consulting, literature and audiovisual methods, as well as inherent cognitive critical analysis (25,26). The importance of this methodology justified its inclusion in the medical curriculum (27).

It is interesting to emphasize that despite the importance given in the survey to those "learning styles", the evaluation of this item is lower than in the others, though, slightly higher in the NH. This is not a surprise

given the best possibilities of audiovisual and bibliographic methods available in the NH; in the future it is necessary to correct this gap.

Equally low was the assessment of staff meetings in NH and AH, probably because students do not always feel encouraged to participate, since, in some cases, they serve to address hospital organization and department management. It would be important to provide a more active clinical manner to these meetings, presenting clinical oral cases and literature review (28).

With regard to future prospects in terms of career, there were not significant changes after Clerkship, against what might be expected, once the students are attending the last year of their undergraduate course and will have to choose specialty soon.

Several factors contributed for the good results, in particular the action of the tutors which has been properly valued in various publications. Thus, Roberts 29. refers that 19 "teaching fellowships" positions were created at Bristol University to collaborate in the students instruction at 7 AH, carefully specifying the goals to achieve (Top tips); the same was referred by Man 30), proposing to residents with tutors duties, frequency in the 4-week courses, where the various teaching methods are discussed. For the FMUP clerkship, surgeons with pedagogic experience in graduate studies were selected as tutors. Likewise we intend to praise the good technical and pedagogical level of the affiliated hospitals residents who participated as tutors.

Finally it is important to enhance the level of satisfaction reported by students who attended the 6th year clerkship Surgical essentially highlighting the important contribution provided by affiliated hospitals.

CONCLUSION

It is possible to conclude that the collaboration of the AH in Surgical Clerkship of FMUP students in the 6th year is a valid and efficient option, not being inferior to NH. The indispensable need for a coordinator to lead the clerkship must be highlighted, ensuring good coordination of teaching in different hospitals, and the development of a well-built Logbook, in order to unify and standardize, as much as possible, both teaching and learning and the assessment of students, distributed across different hospitals.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

JPAT, CR and JA devised the study and drafted the manuscript. LM performed the statistical analysis.

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