Decision Making in Different Care Settings: Do Undergraduate Students Already Care?
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Abstract

Purpose: The process of decision making in medical practice has been studied extensively. However, the influence of different care settings on that process has not been examined to date. Do undergraduate medical students already adjust their decisions to the varying conditions of two different care settings?

Methods: Starting on August 12th until September 23rd 2015 a complete semester cohort of students in their 5th year of medical studies attending a practical course in primary care at the University of Muenster was asked to answer questions about 6 paper cases on usual patient encounters. All students received the same cases. However, half of them should imagine they had to deal with the cases in a tertiary-care context, whereas the other half should picture to be confronted with the cases in a primary care context.

Results: Differences between the two groups were found concerning decisions made with respect to the management of the cases. Those differences indicate that undergraduate students already include differences in care settings in their decision making processes.

Discussion: As decision making in medical care is an essential part of a physicians' daily routine and has tremendous impact on all parties involved, the results stress the need for addressing the different care settings as an influencing factor in undergraduate and continuing medical education.

Keywords: Care settings; Medical decision making; Primary care; Specialized care; Undergraduate medical education

1. Introduction

Decision making is one of the essential skills that people and especially physicians have to master every day. Its importance becomes most obvious in erroneous situations.

Superficially, one could distinguish between two different forms of decisions: the decisions built on reasoning and those built on intuition. Regardless of that, the decision itself is dependent on several factors and is threatened by biases that are not exclusively existing in medical decision making. For example, besides common biases as confirmation-, representativeness-, availability and framing-biases (to state only a few), the expertise and the experience of a doctor and his or her background (e. g. sub-specialities obtained during promotion, current profession) could impact that process. There is evidence that the
current mood of a doctor influences the decision making process, too.\textsuperscript{2,4,5} As stated above, faults in decision making processes are predominantly recognized when they lead to harms for patients. Nevertheless, there are more dimensions of effects than primary treatment outcomes. Is there any influence from the site of care?

In our view, the setting of a specific patient encounter will directly influence the decision making process of a doctor and/or the patient. It is well known from literature that there have to be different approaches to care according to varying settings.\textsuperscript{6,7} The pre-test-probabilities or predictive values of diagnostic tests,\textsuperscript{8} for example, differ between settings. Hence, the procedures need to be adjusted. Besides the patients may have expectancies that need to be addressed as well. For example, a patient showing up in an emergency department after a bicycle-accident may expect other diagnostic tests than a patient reporting to a family physician’s office. Moreover, the diagnostic tests chosen by physicians in each setting may be influenced by the patients’ anticipated expectations, by the availability of diagnostic equipment and its accessibility and by the doctors’ expertise in using and/or applying available diagnostic tests, too. Certainly, the biases described above, such as the representativeness bias, may be inherent to some of those expectations of both parties.

In this cross-sectional cohort study we wanted to investigate whether or not the setting of care influences the clinical decisions made by undergraduate medical students in their 5th year of studies (that means, that they are in their third year of clinical studies). At our faculty, a modulated, horizontally integrated\textsuperscript{9} undergraduate curriculum\textsuperscript{10} is in place in the clinical parts of studies. As lectures, clerkships and practical courses within the specialized subjects (hospital) as well as lectures, clerkships in ambulatory care subjects and the first week of our practical course had already been absolved by the targeted students, they had at least some experiences in both environments before answering those questions. We assumed that they were able to differentiate between those two care settings. Beside the already discussed influences, attitudes and students’ pre-assumptions concerning the different sites of care may have an impact on the decision making process, too.\textsuperscript{11} Unfortunately, the answers could also be manipulated due to the Hawthorne-effect.\textsuperscript{12}

2. Methods

2.1 Overview

This cross-sectional cohort study is a discovery-type of scholarship according to Boyer,\textsuperscript{13} since no literature was found examining the effect of different care sites on the decision making process of undergraduates nor graduates in medical care and education. For the study a mixed methods approach (a so called “mixed model study” after Tashakkori and Teddlie [1998], to be more specific\textsuperscript{14,15} was employed. Accordingly, the three steps of the study were\textsuperscript{14}: 1) triangulation-type investigation, 2) qualitative and quantitative data collection and operations (qualitative: answers to open questions of the questionnaire; quantitative: site of care determination, sex), and 3) statistical analysis and inference (quantitative).

The literature search was conducted in several different approaches. Literature concerning decision making processes in undergraduate medical students due to different care settings was searched in Google scholar, PubMed, Medpilot, PsycINFO and ERIC. Search terms were, for example, (“Curriculum”[Mesh] AND “Decision Making”[Mesh]) AND “Education, Medical, Undergraduate”[Mesh] OR (Curriculum AND Decision Making AND Education, Medical, Undergraduate), filter: Review” and “(family physicians OR general practitioner OR primary care) AND (specialty OR specialized Care) AND difference”.

Concerning possible biases affecting the decision making process the search terms were, for example, “affect OR mood AND doctors decision AND review” used in PubMed and Google scholar. A forward search was added in terms of checking the references and affiliated citations in every article, which was identified as being applicable, found within the described search-algorithms. The literature search and the following critical appraisal and selection was conducted by the principal researcher (RJ). As reference-management software Zotero\textsuperscript{16} was used in the version 4.0.28.1. The references in this document follow the American Medical Association (AMA)\textsuperscript{17} referencing style.

The Ethics Committee of the Medical Council and the University of Muenster approved the study under the reference number: 2015-340-f-S.

2.2 Participants

Undergraduate medical students in their 5th year of studies were asked to answer questionnaires on 6 patient cases during the seminars belonging to the curricular practical course in primary care at the University of Muenster from August 12th until September 23rd 2015. Although every student was obliged to fill out the questionnaire as a part of the curricular seminar-day, the participation in our study (agreement that we were allowed to analyze the data) was voluntary. We randomly assigned the students to two different groups and addressed the gender aspect to make sure that the
overall distribution of the semester between male and female students was respected (nearly similar to a “stratified random sampling” whereas all data of the voluntarily participating students were collected and gender-distribution was respected).

91 of 102 students (89.2%) voluntarily took part in the study. 2 participants (2.2% of the total of 91 participants) did not indicate their sex. Of the remaining 89 students, 40 were female (44% of the total of 91 participants, 44.9% of the participating, sex indicating students) and 49 were male (53.8% of the total of 91 participants, 55.1% of the participating, sex indicating students). 2 participants failed to indicate their age. Of the 89 remaining students, 4 were 20–23 years old (4.5%), 67 were 24–28 years old (75.3%) and 18 (19.8%) were older than 28 years.

2.3 Material

For the questionnaire we constructed 6 different cases representing 6 frequent patient encounters that are observed frequently at both sites of care (primary care offices and emergency departments). The case information was intentionally kept short to foster decision making on necessary actions in order to care for the particular patients. The cases were initially created by the principal researcher (RJ) and then discussed within a team of 4 other family physicians (SL, HW, PJ, PM) working at the same department as the researcher. Afterwards the cases were sent to the thesis-advisor (HS) and his team (2 colleagues, LZ and SM) for further review. Minor adjustments to the cases have been made after each step. Thus a DELPHI-process was employed.

We used paper-based questionnaires with open answers because our first idea, a technical conduction with tablet-devices for every student via the ILIAS platform in place, failed in terms of system-stability in the testing-phase. We posed open questions and decided for a qualitative approach as basis for the questionnaires to minimize hints and to foster getting deeper insights into the students’ thoughts.

One group got the cases of patients presenting at a primary care office. The other group was confronted with the cases being reported at a specialized unit (interdisciplinary emergency room in a hospital). The cases were the same in both groups, only the setting differed. The questionnaires are available through the author (RJ) upon request in the original German language as well as in an English translation. One translated case is attached in the Appendix as an example.

The first case (chest pain) contains some facts that make an acute coronary syndrome at least a possible diagnosis. The second case (abdominal pain) again bears a hint (tenderness) that makes a further, most likely specialized investigation/procedure necessary. The third case (cough) is more undetermined and leaves more latitude to the physicians/students. It is possible to follow a wait-and-see-strategy but also to opt for some immediate specialized further investigation (e.g. chest-x-ray). The fourth case (back pain) is likely to be uncomplicated and can easily be treated in the ambulatory setting alone. The fifth case (ankle pain) contains some evidence that a further investigation is reasonable (x-ray, according to the Ottawa ankle rule). The last case (weird) is the most deficient case in terms of necessary information - hence it offers the largest amount of ambiguity. It leaves a great amount of latitude to the physicians/students dependent on the findings of further (primarily not-specialized) investigation.

2.4 Procedure

The predominantly practical course in primary care offices connected to the university is aligned by seminars that cover at least 20% of the course-time. We established 2 seminar-days per block at our faculty. The seminar days are mixtures of different learning formats. There are seminars, courses on basic skills (e.g. ECG-lead-application, pulse-detection sonography) and simulated-patient-encounters aligned with formative feedback. We integrated the questionnaires for this study and the associated seminars as a newly designed, fractionated session into our second seminar-day.

Before the students read about the appropriate setting within the questionnaires, we sensitized them in the prior lead-in-seminars. So some kind of self-reflection and may be, after having been sensitized for that topic, even some kind of self-explanation was hopefully achieved. The lead-in-seminars were held directly before the students were asked to answer the questionnaires to clarify the task, anticipate possible questions and of course to sensitize the students for those different settings. During this part we asked the students to write down the differences between the two settings that come to their minds within 3 min. Those notes were not analyzed in this study because they were not part of the ethics approval. The time for working on the questionnaires amounted to 60 min. The overall time for the lead-in- and fractionated lead-out-seminars and the work on the questionnaires summed up to 170 min per block. As problems in the
decision making process become most obvious in erroneous cases, we enriched our lead-out-seminars with critical incidents and how to learn from faults (e. g. numbers, frequent sources of errors, prevention-and coping strategies).24–26

2.5 Analysis
As we collected the qualitative data paper-based, one researcher (RJ) transferred the notes to a Microsoft Excel table, categorized the answers in a first step and afterwards appointed numbers for each category (quantizing) in IBM SPSS Statistics 22.27–28

The independent variables had already been categorized, being the site of care, the age and the sex. The primary care setting was labeled as 0, the specialty care setting with the number 1.

The age was kept in the 3 categories indicated on the questionnaire: 20–23 years, 24–28 years and > 28 years. The sex was labeled with 0 for female and 1 for male. Question 1 was analyzed concerning the total numbers of the differential diagnoses and, out of this, the total numbers of the dangerous and less dangerous differential diagnoses.

The categories for the most probable diagnosis question (question 2) were “dangerous” and “less dangerous” conditions. Specific to the cases the categorization was performed regardless of the most reasonable answers to those questions. If a diagnosis was categorized as “dangerous” or “less dangerous”, it accounted for both groups (primary care setting and specialist unit). Afterwards, numbers were appointed to the two categories: 0 for “less dangerous”, 1 for “dangerous”.

In the chest pain case, for example, the diagnosis myocardial infarction (MI) was labeled as “dangerous”, whereas the diagnosis chest pain due to musculoskeletal disorders was labeled as “less dangerous”. In some cases the labeling was more difficult. For example, the exacerbation of a chronic obstructive pulmonary disease (COPD) in the cough-case was labeled as being “less dangerous”, despite this condition could lead to a life-threatening state for the patients in practice. Nevertheless, that diagnosis is a frequent one in both care settings and in the setting of primary care it is mostly managed without any need for a referral, hospital admission or other specialty-demanding diagnostic or therapeutic procedures. All categorizations were done by the principal researcher (RJ).

The second categorization was performed for the further proceeding questions (question 3). Again, two categories were built: “primary care approach initially possible” (coded with the number 0) and “specialty care/diagnostics initially necessary” (coded with the number 1). Again, the categorization of an approach accounted for both groups. For example, the direct need for a chest x-ray in the cough cases was categorized as “specialty care/diagnostics initially necessary”. The wait-and-see-strategy combined with symptomatic therapy was in this case labeled as “primary care approach initially possible”. But there are some categories that need further explanation as well. For example, the possible need for a chest x-ray depending on the findings of the physical examination, that needs to be performed as a first step, was categorized as “primary care/diagnostics initially possible”.

As the single cases are items in a test, overall-comprehensive variables were computed for the overall-number of differential diagnoses, the overall-number of dangerous and less dangerous differential diagnoses, the overall-labeling of the most probable diagnosis as dangerous or less dangerous and for the overall-proceeding decisions indicating a primary care approach as initially possible or initially recommending specialized care/diagnostics. Next the data were computed with IBM SPSS Statistics 27–28 where a comparison of mean averages of the above stated comprehensive variables (ANOVA14) was performed. The threshold for the significance (p-value, α) was set to be less than 0.05.

2.6 Evaluation
We did not establish an additional, systematic evaluation as two evaluations already exist for the practical course (one faculty wide, merely superficial evaluation [mainly focusing on the satisfaction level, Kirkpatrick level 129] and one more detailed, semi-quantitative evaluation focusing on in depth information concerning good and improvable aspects within our practical course [both: in the offices and the seminars] and an overall ranking). ¼ of the semester cohort was orally asked concerning the effectiveness of the learning spiral30 established as a side effect (see: discussion-section). According to Kirkpatrick29,31 the levels thus evaluated are one to two or three (full citation: “…1: learner satisfaction or reaction to program; 2: measures of learning attributed to the program […] ; 3: changes in learner behavior in the context for which they are being trained;…”31).

3. Results
For the independent variables age and sex the significance level for any difference was not reached
in any of the mean averages of the comprehensive depending variables.

For the independent variable of the site of care we accordingly checked for differences in the mean averages of the dependent overall-comprehensive variables (total number of differential diagnoses, total number of dangerous and less dangerous differential diagnoses, labeling of the most probable diagnosis as dangerous or less dangerous and the initially necessary/possible further proceedings).

The mean averages of the total number of differential diagnoses for the 6 cases were 4.73 (+ 1.61) in the primary care cohort, 4.39 (+ 1.25) in the specialized care cohort and 4.57 (+ 1.21) for the two cohorts together. However, this did not reach the significance level \((F (1, 89)=1.72, p=.19)\).

The mean averages of the total numbers of dangerous differential diagnoses in the 6 cases were rounded 2.53 (+ .87) for the primary care cohort, 2.40 (+ .84) rounded for the specialized care cohort and rounded 2.47 (+ .85) for both \((F (1, 89) =.55, p=.46)\). The mean averages of the total numbers of less dangerous diagnoses in the 6 cases were rounded 2.19 for the primary care cohort, 2.00 for the specialized care cohort and 2.10 for both \((F (1, 89)=2.19, p=.14)\). Again, the significance level was not reached.

The labeling of the most probable diagnosis as dangerous overall cases occurred in 39% (+ 22.0%) in the primary care cohort and in 47% (+ 18.3%) in the specialized care cohort (both cohorts: 43% (+ 20.6%)). Even those results did not reach statistical significance \((F (1, 89)=3.06, p=.08)\).

The mean averages concerning the further proceedings overall cases showed statistically significant differences between the two cohorts. In 31.39% (+ 20.72%) the participants of the primary care cohort recommended initially specialized care/diagnostics as necessary whereas 50.62% (+ 21.72%) of the specialized care cohort approved that (both cohorts: 40.48% (+ 23.18%); \(F (1, 89)=18.67, p<.001\)).

4. Discussion

The findings support our initial hypothesis that students in their 5th year of studies are able to differentiate between the primary care and the specialized care sector. That differentiation could be due to many factors. On the one hand students might have respected the different pre-test-probabilities in those care settings. Additionally, they may have respected different availabilities of diagnostics and therapeutics there. On the other hand, those results may reflect certain preoccupations or attitudes towards the two settings. As the labeling of the most probable diagnosis did not differ significantly whereas the further proceeding did, the severity of the health conditions may be evaluated differently. Maybe there are more aspects affecting that decision making process which are not obvious. For example, a very good or very poor knowledge about a single health condition will have impact on that process, too. However, the motivation behind the decisions made cannot be clarified out of the present data.

Although it is stated that the future of medical care becomes female, our data do not reveal any relevant gender-specific differences. As said earlier, the sex-distribution in our study was somewhat unexpected. We commonly have slightly more female students than male students in our cohorts. Nevertheless, as no differences between male and female participants or the different age groups could be detected, these issues might not be important for further investigation. Besides that, the trend towards feminization in the medical field is subject to continuous scientific discussions respecting various working conditions and their potential gender-specific impact.

We think that the students might have felt most uncomfortable in working on those cases which were explicitly deficient in terms of information needed. A big ambiguity and hence the inability to recast the problem through comparing (known) patterns is known to be difficult. In other words, the tolerance of ambiguity, although crucial in every day life and especially practice, is tough to bear.

As a side effect, we established a learning spiral by integrating the course into our second seminar-day. After answering the questionnaires the first part of the lead-out-seminars dealt, besides other issues, with an expert approach to outpatients suffering from acute coronary syndrome in the ambulatory setting. After that, the students were asked to deal with a simulated-patient-encounter addressing the same topic. The students had to apply theoretical knowledge, which had been taught some semesters ago in other specialties (e. g. anesthesia) and that had been repeated to some extent in the mentioned lead-out-seminar, to an active patient encounter. Thus the “shows how” level of the Miller’s pyramid was reached and, although only aligned with formative feedback, a more complex level of the according Accreditation Council for Graduate Medical Education-evaluation methods (ACGME-evaluation methods) was employed. After those scenarios the principal researcher (RJ) asked ¼ of the total semester cohort whether or not they had profited from
the repetition of the essential steps of dealing with a patient suffering from acute coronary syndrome (e.g., medications to be administered, dosages...) prior to the simulated-patient-encounter sessions. All of the asked students claimed to have profited from that repetition very much.

4.1 Conclusion

Our results show that the site of care has an impact even on the decision making processes of novices (students in this case). Therefore, this issue should be addressed on a regularly basis in both, the undergraduate and continuing medical education curricula. An early sensitization for and learning of differences between those varying care sites may improve outcomes in terms of patients-safety, satisfaction and health care expenditures. Also interdisciplinary work could be eased by previously informing and teaching medical students about cross-sectional aspects. Further research should be undertaken detailing these initial findings. The author plans to conduct a similar study with residents and experts in the different fields of medical specialization (the primary care section is included here, because in Germany, it is a specialization training as well). Ideally, qualitative interviews could complete the acquired data in future studies and may be warrant some more insights into the motivations that led to the decisions made. It is important to remark that such an additional approach would require a substantial amount of extra-time and other resources.

4.2 Limitations

Although it would have been pleasant to have at least 2 researchers involved in the categorization process, this project was assigned to be a master-thesis-project for the principal researcher (RJ) and therefore had to be developed, conducted and evaluated as autonomously as possible. Moreover, as the built categories and the assignment to them applied obligatory for both sites of care, we rate the possibility of a categorization error that affects the results due to a one-researcher-categorization as very small.

Disclosure

Ethical approval has been granted from the Ethics Committee of the Medical Council of Westfalen-Lippe and the University of Muenster (Reference number: 2015-340-f-S)

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Other disclosure

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Appendix

Example of a medical case (Chest pain)

Mrs. Welsh, a 68 year old lady complains chest pain. The pain began that morning (actually 2 h ago). She presents a decreased overall condition. She is a known smoker (30 pack-years). She admits that she has had such symptoms several times before – but the former episodes did not take that long duration as this time. She reports suffering from a known spinal-syndrome.

1) What are your differential diagnoses (please order according to probability)?
2) What is your working diagnosis?
3) How do you proceed? Please state in note form and timely correct order what you are going to investigate and/or initiate. Please specify your action where applicable (e.g. which medication do you want to administer in what way and what dosage, which laboratory tests would you like to order...).
References


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