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Provision and assessment of pharmacology and pharmacotherapy education across an integrated medical school curriculum

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CHAPTER 5

Creating a culture of thoughtful prescribing

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ABSTRACT

Background: It has been recently reported in the Netherlands that 170,000 patients yearly fall victim to poor communication between health care professionals, with 44% of patients receiving inappropriate therapy as a result. Evidence indicates this problem may be due to physicians learning written communication skills and therapeutic content by unstructured means during training.

Aim: To introduce a structured format for creating and communicating therapeutic plans; to provide students opportunities for practice and feedback on their abilities.

Methods: We developed the Individualized Therapy Evaluation and Plan (ITEP) for therapeutic decision-making and communication based on the commonly used SOAP (Subjective Objective Assessment and Plan) note. The therapeutic plans from students of the 2003 cohort were assessed with one simple and one complex case using a 15-point criteria form. Over the next three years students were given more practice using the ITEP and the average score on the complex case was tracked and compared to the 2003 cohort.

Results: In cohort 2003, 82% satisfactorily completed the simple case, versus only 32% with the complex case. In subsequent years, the average scores on the complex case significantly improved from 3.8 to 6.8 with increasing practice.

Conclusions: Students know how to select a drug, but without practice using the ITEP do not know how to deal with multiple disease states.

INTRODUCTION

Worldwide, there is increasing evidence that medical errors arise from poor communication between health care providers (1-4). In the Netherlands, public concern rapidly increased when it was reported that 170,000 patients yearly fall victim to poor communication between health care professionals (5). This report found that poor communication between health care providers over the prescribed medications led to the patient receiving inappropriate therapy (in 44% of the cases) or no treatment at all (in 25% of the cases). Surprisingly, not all the cases were caused by miscommunication between the physician and the pharmacist, as more than half of these cases were caused by poor communication between physicians (5,6). Unfortunately, the report did not detail all the problems that occurred, it only provided examples for the categories the researchers used (6). Although the authors conclude that these patients suffered due to the poor communication of all medical information, their data clearly suggest that in 69% of the cases the insufficient transfer of the therapeutic information resulted in a problem.



This should not be surprising as in contrast to other aspects in medical charting (review of systems, physical examination, etc.); physicians learn a variety of methods for communicating therapeutic information. There is a growing body of literature that documents the lack of proper training of physicians in the area of rational drug prescribing (7-9). One method endorsed by the American Family Physicians to facilitate communication between health care providers is the use of the Problem-Oriented Medical Record (POMR) (10). The POMR uses a structured format (SOAP = Subjective, Objective, Assessment, Plan) for consistently presenting each medical problem that a patient may have. The POMR is widely used in the United States and it has been shown that records using this structured format are more complete than those using free dictation as a format (11,12). More importantly, other studies seem to support the hypothesis that the POMR may have improved the thoroughness of patient care when they evaluated the outcomes for patients (13,14).

In the Netherlands, there is no nationally (or even in our case, locally) accepted format for the medical charting of therapeutic information. At Leiden University Medical Center, it has been assumed that students will learn how to solve and communicate therapeutic plans from the traditional teaching model employed in medical schools: the apprenticeship. However, the therapeutic format employed as well as the success of the educational process will always vary depending on the site and mentor. In a previous study we determined the extent of the local problem by examining the therapeutic contents of consult letters written by specialists to the referring general practitioner (15). While most letters contained enough information regarding the diagnostic aspects for the problem for which the patient presented, there was insufficient information for the general practitioner to follow the therapeutic plan. Our findings provided the stimulus to have our medical students learn how to develop and communicate a therapeutic plan in the same manner in which they learn to develop and document the diagnostic process.

For this process to be successfully implemented in clinical practice, developing a therapeutic plan needs to become inculcated into the way a physician practices, and become as second nature as the diagnostic process. Educational evidence suggests that skills such as using a more structured patient reporting format needs to be introduced early in the curriculum in order to enhance adoption (16-18). Previously, another group attempted to systematize the teaching of POMR in second-year medical students. The results of their controlled study of two different instructional formats: self-instruction and workshop were determined by assessing the student's ability to convert a case to the POMR format. Their results suggest that all student groups attained an acceptable performance level no matter which format they experienced (19). Lastly, self-study assignments and assessments by which students can repeatedly practice and evaluate their performance have been shown to advance learning (20,21). Thus, our



goals were 1) to introduce early into the Leiden University Medical Center curriculum a structured format for communicating a therapeutic plan; 2) to give the students multiple opportunities throughout the curriculum (both pre-clinical and clinical) in which to practice and have feedback on their therapeutic planning skills, and 3) to assess how students perform when using the therapeutic plan format.

METHODS

Educational methodology

At Leiden University Medical Center we introduced a structured format called the Individualized Therapy Evaluation and Plan (ITEP) for students to apply therapeutic knowledge. The ITEP format is used to aid therapeutic decision-making and communication and is based on an expanded SOAP (Subjective Objective Assessment and Plan) note (22) from the POMR. The difference between the ITEP and the SOAP is that the ITEP minimizes the subjective and objectives portions of the SOAP, while expanding the assessment and plan sections to include more therapeutic information (see table 1). The assessment includes an evaluation of the clinical presentation, pathophysiology and current therapy that is patient-specific and relevant for that moment. The choices made for the plan for treatment and monitoring must include a rationale that is relevant to not only the patient, but also society (i.e. costs). The aim of using the ITEP during pharmacotherapy training is to give the students practice opportunities for drawing up and providing a rationale-based treatment plan for an individual patient. Students are provided the format as well as clear performance criteria (see Appendix A), so they can know how well they are performing this task during their practices. Repetitive and consistent utilization of this criteria form during self-, peer-, and instructor-evaluations allows the students to incorporate the therapeutic decision making process into their patient care practice.

Students are introduced to the writing of the ITEPs early in the curriculum (in the beginning of the second year) and continue to practice through their clerkships. The students' first experience with ITEP writing is in a workgroup situation where the students write an ITEP individually and their peers evaluate the ITEP based on the workgroup leader's feedback. The cases provided to the students are such that the patient presents with a clinical presentation that is typical for a particular disease state, and warrants treatment with the standard first-line therapy found in most treatment guidelines. This is to make sure that the students learn the pathophysiology of different disease states, understand the pharmacology of the most commonly used medications for that disease, and finally why one drug is considered to be the drug of choice. Individual student participation



Table 1

The Individual Therapy Evaluation and Plan (ITEP) method for developing and communicating a therapy plan

Evaluate the patient's disease states:
• Make a list of disease states and indicate the status of each • Describe the aetiology / pathophysiological mechanism of each problem • supported with the complaints, symptoms and results of the patient
Evaluate current therapy for each disease state:
• Determine if current therapy is effective and safe (without side effects) • Support this by comparing the relationship between the pathophysiology • of the medical problem with the mechanism of action of the therapy and • evaluating the patient's complaints, signs and symptoms
Evaluation of patient-specific parameters that can influence therapy:
• Patient specific data (PK, allergies, side effects) • Drug specific data (dose, cost, interactions) • Disease specific data (drug-disease interactions) • Patient compliance
Write a therapy plan based on your evaluation:
• Indicate your plan for current therapy (stop, continue, increase/decrease dose, etc • Choose (if necessary) new therapy (non-drug, drug, surgical, etc.) • Specify for each therapy the dose, route, frequency and duration • Provide the rationale for your choice of therapy, dose, etc. Support this by describing • the mechanism of action and impact of patient-specific data (as described above)
Monitor therapy plan:
• Describe the goals and monitoring parameters to determine efficacy • (patient-specific pathophysiological symptoms) of the therapy • Describe monitoring parameters to determine side effects and toxicity • (pharmacological symptoms) of the therapy • Establish appropriate time intervals and frequencies for these parameters

in the workgroup is ensured by the incorporation of an ITEP writing section on the course exam that is a follow-up moment of the case presented in the workgroup. The follow-up cases are based on a clinical situation in which the patient presents with a drug-related problem as described by Helper and Strand (see table 2) (23,24). Because the types of (and solutions for) drug related problems are finite in number, students can study by predicting the patients' clinical presentation on the exam.

Throughout the rest of the curriculum, students are given opportunities to practice ITEP writing after either witnessing a patient presentation during



lecture or reviewing computerized ‘paper’ patient cases (covering various clinical presentations) and using an online editing program. The students then get feedback either 1) directly during the lecture, 2) from the online editing program, 3) through discussions during workgroups, or 4) in review sessions prior to the examinations. During the clerkship portion of the curriculum, the students write ITEPs for patients seen on rotations. During the internal medicine rotation for example, the students are instructed to write five ITEPs and direct their cases toward the most common disease states based on morbidity/mortality data (e.g. hypertension, diabetes, etc).

Table 2 *Drug related problems*

1	Untreated medical problem
2	Improper medication selection
3	Too little medication
4	Failure to receive medication
5	Too much medication
6	Adverse drug reaction
7	Drug interaction
8	Medication use with no indication

Evaluations

ASSESSMENT 1: During the first year of adoption (2003), students were taught the ITEP principles and then given computerized practice cases to study in the two final courses prior to clerkships. The assessment of this cohort of students served as a baseline to evaluate student performance when using the ITEP to solve two different therapeutic cases. The cases differed in topic and complexity: the paediatric case was simple with a single disease state; the geriatric case was complex with multiple disease states. On the paediatric ITEP exam, the student only had to determine that current non-drug therapy was not effective and that new drug therapy had to be started. On the geriatric ITEP exam, the student had to manage a drug-induced side effect, an under-treated disorder and a non-treated problem. The ITEP exams were blinded and then assessed using a 15-point criteria form spanning the therapeutic plan. The assessment determined if 1) the ITEPs were satisfactorily completed, and 2) which section of criteria was the most difficult for the students.

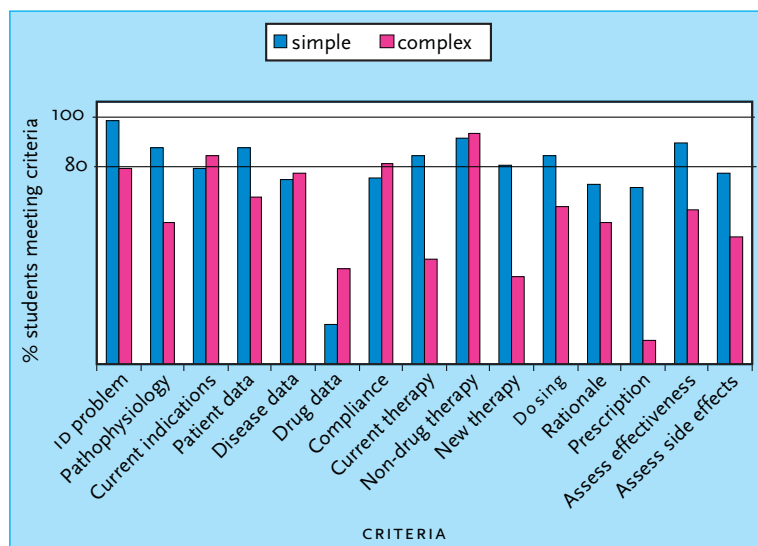
ASSESSMENT 2: In the subsequent years, each cohort of students increasingly followed the curricular plan as described in the education methodology section. As such, we tracked the number of ITEP cases with



which the students had been assessed prior to taking the geriatrics exam with the complex case. The second assessment then tracked student performance on making a therapeutic plan on the complex geriatrics case, and compared to the students' performance on ITEP writing from the first year of adoption (cohort 2003).

Figure 1

Percentage of students able to meet each criterion on the ITEP Criteria Form



STATISTICAL ANALYSIS

For the first assessment, the percentage of student ITEPs not meeting each of the criteria (designated as [-] on the criteria form) was assessed (those ITEPs that were evaluated as either mostly meeting criteria [v] or meeting criteria [+] were grouped). Comparison between student cohorts 2003 and the years 2004, 2005 and 2006 was evaluated by using an analysis of variance after scores were normalized to ten.

RESULTS

ASSESSMENT 1: In the 2003 baseline cohort, 82% of the 221 students satisfactorily completed the simple case, while only 32% of 181 students did so with the complex case. Figure 1 shows the percentage of students able to meet each criterion when creating a therapeutic plan for a simple and complex case. For the simple case, the ITEP criteria analysis identified only



drug interactions as something with which the students struggled. In this case nearly 85% of the students failed to see that the recognized 'drug-of-choice' had a potential for drug interactions. In the complex case, students only did slightly better at recognizing potential drug interactions, as still 61% had difficulties. Overall, more than 40% of students were unable to meet half of the criteria. In addition to identifying drug interactions, the students could not meet the criteria for assessing pathophysiology, and current drug therapy, as well as determining plans for current or new drug therapy, the proper dosing and indicating the goals or monitoring parameters for efficacy and toxicity of the plan.

ASSESSMENT 2: The results of assessment 2 are shown in table 3. The number of previous assessments using the ITEP format increased for each cohort of students. Each year's cohort of students also performed significantly better than the 2003 cohort which had little practice.

Table 3 *Data from the four cohorts taking the complex geriatrics exam*

	2003	2004	2005	2006
N students assessed	181	285	271	264
# of previous ITEP exams	1	2	4	8
Average score	3.83	4.79	6.53	6.76
Change from cohort 2003 (SE)	-	0.96 (0.27) p=0.0005	2.70 (0.27) p<0.0001	2.92 (0.28) p<0.0001

DISCUSSION

Our results suggest that the students were able to use the ITEP format for writing their therapeutic plans and that the continued use of the ITEP format in the curriculum improved the students' ability to solve case studies and communicate therapeutic plans. Our initial assessment of the first cohort indicated that students in their final courses prior to clerkships were able to solve simple cases. In addition, they were able to adopt the ITEP format for communicating the information fairly well. However, when given a case of a typical geriatric patient that involves multiple disease states and unresolved problems, the students struggled. While most of the criteria were not satisfactorily met for more than 20% of the students, certain criteria were rarely addressed appropriately by the students. These included assessment of the current therapy, determining appropriate new therapy, identifying potential drug interactions, and accurately writing a prescription. To illustrate the types of problems the majority of students (57%) had with



assessing current therapy, students often missed or identified the wrong drug causing a drug-induced problem (in this case side effects). Because of this, 64% students' new therapy plans would include starting a new less-effective drug for a well-treated condition, or starting the patient on another drug to solve the side effect. Regardless of the assessment or plan that the students developed, 61% did not identify the potential drug interactions that existed in their plans. Finally, most (90%) were unable to make a definitive decision regarding the therapy regimen they had chosen and thus wrote inappropriate prescriptions. Most commonly the students would forget frequency regimens, or only indicate dosing ranges instead of a specific dose, but sometimes their prescriptions would border on nonsense e.g. 'perhaps maybe the patient should be started on something like a broad spectrum antibiotic'.

The follow-up assessments that took place in the three years after the introduction of the ITEP in the curriculum had shown significant improvement in the students' abilities to use the ITEP to solve therapeutic problems. Students were now able to do a better job assessing current therapy and developing a therapy plan, but had become more lax at providing monitoring parameters for safety (criteria #15 of the ITEP).

We are encouraged by the progress that the students have made over time particularly in their ability to write more concise, definitive therapy plans. We think that using ITEPs for practice and for assessment has improved the pharmacotherapy education at our institution. Most institutions choose to assess students with multiple-choice questions in order to differentiate the students from strongest to weakest. However, we feel using the open questions in the ITEP format offers more: 1) It provides the students with practice and feedback on an activity that is applicable to the activities of a practicing physician; 2) it prevents students from using therapeutic algorithms to determine therapy in a cookbook fashion; 3) it provides training in good prescribing habits; 4) it addresses the problem of poor communication between clinicians which we hope will ultimately have an impact on patient care, and 5) it prepares students for the use of electronic patient medical records.

On this last point, it has previously been suggested that use of the electronic patient medical record can solve the communication problem (5). But this is unlikely, as the ability to communicate depends on both the form and the content of the electronic patient medical record. In addition, current electronic patient medical records are limited to the sharing of patient data such as past medical history, medication lists, and results of physical examinations and diagnostic tests (laboratory, radiological, et cetera) with limited possibilities for the documentation of a therapy plan. Physicians first need to learn a structured method in which to uniformly enter information regarding the therapy plan into a patient chart, then this format can be adopted by the electronic patient medical record.



LIMITATIONS

We recognize that the improvement in ITEP scores between the 2003 and 2006 cohorts could be attributed to a number of factors. First it is possible that the evaluations of the ITEP between the cohort years could have been biased. Unfortunately, the same cases could not be given between the years due to a change in course coordinators and focus of topics taught in the course. In addition, the evaluators could have expected a poorer outcome and thus gave lower scores at the outset or made the first case significantly harder. However, this would be unlikely, as this would have resulted in too many 'good' students having a poor grade. Conversely, if the second grade is graded too easy, too many 'poor' students would receive a passing grade. It is also impossible to attribute these findings to the impact of the introduction of the ITEP into the curriculum alone. Other possibilities outside the control of the researchers include: 1) the later cohorts could have consisted of stronger groups of students; 2) other changes in the curriculum had occurred between the cohorts, improving their abilities; 3) the students now knew the impact the ITEP had on their grades and studied more for the exam. Lastly, the ultimate goal of our educational intervention is to improve patient care by improving physicians' communication of therapeutic plans (as described in the background study for this paper (15)), but this assessment is not yet possible since the later cohorts have yet to achieve prescribing rights.

CONCLUSIONS

We were able to develop a new format (the ITEP) for students to use to develop and communicate therapy plans. With little practice, students could use the ITEP to develop simple therapy plans where they were only required to know how to start a drug of choice. However, they were not able to deal with difficult cases in which there were multiple problems or current therapy that is not working. After practicing with the ITEP throughout the curriculum, subsequent cohorts of students were able to greatly improve their ability to develop and communicate therapeutic plans for the more difficult cases.



- (-) ITEP does not meet the given criteria; ITEP requires changes.
There are missing data or information is not understandable.
- (v) ITEP mostly meets the given criteria; it requires only a few clarifications.
- (+) ITEP meets the given criteria; it requires no changes and can be included in the chart of the patient.

	-	v	+
1 Identifies the medical problems and indicates the status			
2 Briefly describes the pathophysiology and supports it with the complaints, symptoms and examination results of the patient			
3 Evaluates current indications by comparing pathophysiology to the pharmacology			
4 Describes patient data (pharmacokinetic, allergies, ADR's) that can influence therapy			
5 Describes disease data (disease-therapy interactions) that can influence therapy			
6 Describes drug data (dosing, regimen, interactions) that can influence therapy			
7 Assesses patient compliance			
8 Indicates plan for current drug therapy			
9 Describes plan for non-pharmacologic/surgical therapy			
10 Chooses (if necessary) new drug therapy			
11 Identifies correct dose, route, frequency			
12 Provides rationale for drug, dose, route, etc.			
13 Writes a complete prescription			
14 Identifies monitoring parameters for efficacy			
15 Identifies monitoring parameters for toxicity			



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