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Self-reported confidence in prescribing skills correlates poorly with assessed competence in 4th year medical students

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ABSTRACT

Aim

This study investigated the relationship between students' self-reported confidence and their objectively assessed competence in prescribing.

Methods

The competence in several prescribing skills of 403 fourth-year medical students at the VU University Medical Center, The Netherlands, was assessed in a formative simulated examination on a 10-point scale (1 = very low; 10 = very high). Afterwards, the students were asked to rate their confidence in performing each of the prescribing skills on a 5-point Likert scale (1 = very unsure; 5 = very confident). Their assessments were then compared with their self-confidence ratings.

Results

Students' overall prescribing performance was adequate (6.97 ± 0.83), but they lacked confidence in two essential prescribing skills. Overall, there was a weak positive correlation ($r = 0.19$, $P < 0.01$, 95% CI 0.09 to 0.29) between reported confidence and actual competence.

Conclusions

This study suggests that self-reported confidence is not an accurate measure of prescribing competence, and that students find it difficult to identify their strengths and weaknesses in prescribing. Future studies should focus on developing validated and reliable instruments so that students can assess their prescribing skills.

INTRODUCTION

Rational prescribing is a core skill for medical doctors, and for this reason many medical curricula give priority to teaching medical students how to prescribe rationally. Despite this emphasis on the acquisition of prescribing skills during medical training, relatively little is known about the actual ability of students to prescribe effectively and safely by the time they graduate. A number of studies have revealed that medical students lack confidence[1-4] and have poor prescribing skills prior to qualifying.[5-7] Recently, we showed that while the prescribing skills among nearly graduated medical students were more than adequate after an undergraduate context-learning pharmacotherapy programme, most students did not feel confident about two essential prescribing skills (i.e., verifying the treatment suitability and choosing the correct (drug) treatment).[8] This finding raises the question whether students' self-reported confidence in prescribing skills is reflected by their actual prescribing competence. If self-reported confidence and assessed competence are correlated, then self-reported confidence might be a way to identify weak areas in prescribing skills that require specific educational attention and training. Moreover, increasing students' confidence may increase their acquisition of prescribing skills and competences. Therefore medical curricula should aim to make students as confident in their prescribing ability as possible by the time they graduate. Previous studies have identified little or no association between self-assessment measures and objectively measured competence across a range of students at different levels.[9-16] However, these correlation studies primarily focused on the performance of routine procedures or practical clinical skills, and none investigated the relationship between self-reported prescribing confidence and assessed prescribing competence. The aim of this study was to determine whether self-reported confidence is associated with objectively assessed prescribing competence.

METHODS

Participants

From January 2011 to January 2013, all fourth-year medical students at the VU University Medical Center (VUmc), Amsterdam, The Netherlands, were included in the study. All students were due to be assessed as part of their compulsory end-of-year examination. Prior to this assessment, all students had received a context-learning pharmacotherapy training programme during the first four years of the undergraduate medical curriculum. In short, this programme comprised four years of theoretical and practical context-learning pharmacology and pharmacotherapy education given in the form of lectures, small-group sessions, role-playing sessions, and prescribing tasks during clinical clerkships.[8]

Prescribing competence

Towards the end of their fourth year, all medical students completed a formative Objective Structured Clinical Examination (OSCE) including a 15-minute evaluation of prescribing skills. This consisted of performing a therapeutic consultation (TC) with a simulated patient with one of the eighteen clinical problems covered in the pharmacotherapy training programme

(Table 1). The student did not know which specific clinical problem would be tested prior to the examination. Before the start of the TC, the student was given, at random, a short written case report of a patient with one of the clinical problems and was asked to formulate a therapeutic plan based on the World Health Organisation (WHO) six-step approach.[17] In total, there were twenty written cases, some of which described the same clinical problem but differed in e.g. sex, age, comorbidity, comedication, and drug allergy (an example is shown in Figure 1). The student performed the TC with the simulated patient, evaluating the patient's symptoms and discussing the proposed therapeutic plan with the patient. Then the student, together with the patient, established the definite therapeutic plan. A pharmacology teacher observed and assessed student's competence during the TC. After the consultation, the pharmacology teacher discussed student's competence and his/her choice of treatment plan with the student.

WHO six-step plan

The WHO six-step plan is a normative model for therapeutic reasoning and prescribing, and provides a six-step guide to rational prescribing. It has been used as a tool to evaluate prescribing competence in a variety of international settings across a range of students at different levels.[18-25] All six steps are based on core learning objectives, namely, knowledge, skills, and attitudes, as formulated by Nierenberg and Walley.[26,27] The six steps are shown in Table 2.

Table 1. Overview of the clinical problems for which students are trained during the pharmacotherapy programme.

Diagnosis
1. COPD/asthma
2. Bronchitis
3. Otitis media
4. Constitutional eczema
5. Skin wound
6. Essential hypertension
7. Angina pectoris
8. Migraine
9. Urinary tract infection
10. Renal colic
11. Contraception
12. Dysmenorrhoea
13. Peptic ulcer/reflux oesophagitis
14. Diabetes mellitus type 2
15. Iron deficiency anaemia
16. Osteoarthritis
17. Depression
18. Conjunctivitis (bacterial/allergic)

Self-reported confidence

One day after they took the OSCE, the students were invited to complete a self-administered Internet-based questionnaire (using surveymonkey.com) on their confidence in the prescribing skills that had been assessed in the examination. Confidence was defined as the feeling of trust in one's ability to perform each prescribing skill during a TC with a simulated patient. This definition of confidence was mentioned in the questionnaire and thus shared with all responding students. The questionnaire took 5 minutes to complete. Students were sent reminders after 1 and 2 weeks; they were able to complete the questionnaire anytime for up to 3 weeks after the examination. Participation was voluntary and without reward; confidentiality was guaranteed. Student identification numbers were used to anonymously but accurately identify the subjects and link them to their competence scores.

Scoring and data analysis

The clinical pharmacology teacher scored students' competence on a 10-point scale (1 = lowest attainable score and 10 = maximum attainable score; ≥6 = adequate), using a standardized scoring form based on the WHO steps. To minimize inter-assessor variability, all clinical pharmacology teachers had received a training in how to score students' competence using the WHO six-step approach. In the questionnaire, the students scored each skill on a 5-point Likert scale (1 = very unsure and 5 = very confident). Cronbach's alpha was calculated to assess the internal consistency of competence scores and self-confidence ratings. The relationship between competence and confidence across all prescribing skills was evaluated using the Spearman correlation coefficient (r). A significance level of $P < 0.05$ was used, and r values of 0–0.2 were generally considered weak, 0.3–0.6 moderate, and 0.7–1 strong.[28] The difference between average scores given by the assessors for the various clinical problems was analysed by means of a one-way analysis of variance. In addition, an independent t test was used to analyse differences between male and female students. The data were analysed using SPSS 20.0 (SPSS, Chicago, IL).

RESULTS

Demographics

Of the 665 fourth-year medical students at the VUmc who took the examination, 403 (61%) completed the online questionnaire. Of these students, 276 were female (68%) and 127 male (32%), which is representative of the medical student population in the Netherlands (66% female; 34% male).[29] Table 2 presents students' competence scores for each of the prescribing skills (WHO steps 1–6), their confidence ratings about being able to perform each skill, and the correlation between competence scores and confidence ratings.

Prescribing competence

The mean overall competence of all students was scored 7.0 (SD: ± 0.8); the scores were highly consistent (α = 0.8). Students' competence scores ranged from a mean of 6.4 ± 1.6 for Step 6, "Determining monitoring parameters" to 7.6 ± 1.7 for Step 5a, "Writing a prescription" (Table 2).

General patient information

Name: P. van Groningen	Profession: salesman
Age: 56	Intoxications: smoking (cigarettes)
Sex: male	Allergy: -
Civil status: married	Pregnancy/lactation: -
Children: 2	Other: -

Previous medical history

32 year ago: came to practice: history: childhood: bronchial asthma and appendectomy
30 years ago: ski accident: right knee twisted. Torn meniscus and anterior cruciate ligament tear
4 years ago: diabetes mellitus type II: life style advice + metformin 500 mg 3dd1

Current medication

Salbutamol 200 mcg/dose inhaler, use when needed
Beclomethasone 200 mcg/doses inhaler, 2 puffs daily
Metformin 500 mg, 3 tablets daily

'Present illness' (similar to current medication)

Essence present findings*=

Three months ago Mr. van Groningen came to you for a prescription for his wife. He asked you to measure his blood pressure. He had no symptoms but just wanted to know. His blood pressure was 160/100 mmHg in a routine check. No abnormal findings were found on further history and physical examination.

In the following weeks, his blood pressure was 170/100, 165/95, 170/115 mmHg. After the last measurement – this was one month ago – you ordered some laboratory tests and an ECG. You could not find any cause for the high blood pressure. You told Mr. van Groningen to follow a diet with a low salt and low cholesterol content, and advised him to take more physical exercise. His body weight is normal.

Today, his blood pressure was 175/115 mmHg. He still has no symptoms, and all other findings were normal.

You make the working diagnosis (preliminary diagnosis): **essential hypertension**, not responding to a diet.

Assignment:

Before the consultation (4 minutes):

Draw up your management/treatment plan (WHO six-step approach).

During the consultation (7 minutes):

2a. Inform the patient about your findings of history and examination;

2b. Discuss your management/treatment plan with the patient;

2c. Execute the management/treatment on the patient.

*Only relevant information about the patient is given. You may think you need more information by further history taking, physical or other examinations. If this information is not mentioned below you may assume that the findings are not divergent.

Figure 1. Example of a written patient case, used in the prescribing skill OSCE.

In total, eight clinical pharmacology teachers evaluated the students' competence. There was no significant difference between the scores given by the assessors (P = 0.1) or between the scores for the various clinical problems (P = 0.2). Furthermore, there was no significant difference between the overall competence scores of the male and female students (7.0 and 7.0, respectively; P = 0.7).

Self-reported confidence

Students reported a moderate-to-high degree of confidence (>3) for most prescribing skills; the scores were highly consistent (α = 0.8). Their mean score was 3.4 (± 0.5; Table 2). Students felt the most confident about Step 5a, "Writing a prescription" (4.0 ± 0.8) and the least confident about Step 3b, "Verification of treatment suitability" (2.7 ± 0.9) and Step 4, "Choosing the correct (drug) treatment (3.0 ± 0.8). Overall, female students felt less confident about their prescribing skills (3.4) than male students (3.5), but this difference was not statistically significant (P = 0.1).

Correlations between competence and confidence

Mean competence scores and confidence ratings were significantly correlated (r = 0.2, P < 0.01, 95% CI 0.1 to 0.3) (Table 2). Correlations ranged from 0.0 to +0.2 for the different steps (median = 0.1) and were significant (steps 3a, 3b, 4 and 5a) or not significant (steps 1, 2, 5b and 6).

DISCUSSION

In this study, we found that students' self-reported prescribing confidence was significantly, but weakly, correlated with their objectively assessed prescribing competence, an association not reported earlier.

Limitations

Our findings should be discussed in the context of potential limitations in our study design. First, single-site bias might be an issue as the study was performed in a single medical school and involved

Table 2. Mean scores for the students' competence and self-reported confidence, and the Spearman correlation.

WHO six-step	Level of competence (max 10; ± SD)	Level of confidence (max 5; ± SD)	Spearman correlation (r_s)
Step 1: Define indication	7.2 ± 1.3	3.9 ± 0.6	0.0
Step 2: Specify therapeutic objective	6.8 ± 1.0	3.5 ± 0.7	0.0
Step 3a: Specify standard treatment	7.1 ± 1.3	3.5 ± 0.8	+ 0.1**
Step 3b: Verify the suitability of your treatment	6.9 ± 1.4	2.7 ± 0.9	+ 0.2**
Step 4: Choose a (drug) treatment	6.8 ± 1.7	3.0 ± 0.8	+ 0.2**
Step 5a: Write prescription	7.6 ± 1.7	4.0 ± 0.8	+ 0.1*
Step 5b: Give information, instructions and warnings	7.1 ± 1.1	3.4 ± 0.8	+ 0.1
Step 6: Determine monitoring parameters	6.4 ± 1.6	3.6 ± 0.7	+ 0.1
Total	7.0 ± 0.8	3.4 ± 0.5	+ 0.2**

Significant at 0.05* and 0.01** level (2-tailed).

a single undergraduate programme. Thus results might not be generalizable to medical students in countries that use a different teaching method. However, the WHO six-step approach is the most widely tested educational intervention to improve prescribing skills in the world;[30] therefore, the results in this study might be applicable to most countries. Second, there is also the potential for self-selection bias, because students who completed the questionnaire might be more dedicated than other students. Third, the dropout was substantial, with 39% of students not completing the Internet questionnaire. A reason for this dropout might be that participation in the questionnaire was voluntary as opposed to the formative OSCE. Fourth, the 3-week response period might have influenced the accuracy of students' judgment of their confidence. Yet, this effect is probably small because further analysis showed that 72% of the respondents completed the questionnaire within the first week after the assessment (data not shown). Firth, students completed the questionnaire after the assessment, which might have affected their confidence ratings; however, self-assessment is minimally affected by explicit feedback.[31] And lastly, this study was conducted in a controlled situation (OSCE), and it can be questioned whether the same results would have been found in clinical practice with real patients.

Interpretation of the results

Taking these limitations into account, our results may have important educational implications for teaching and assessing prescribing skills and competence during undergraduate medical training. First, because of their poor correlation with an objective assessment, self-confidence ratings should not be used as a stand-alone tool to evaluate prescribing competence, as they may misrepresent the quality of learning being assessed and may not be useful for evaluating prescribing skills. Our findings indicate a need for reliable and valid instruments so that students can assess their prescribing competence.

Second, self-reported confidence surveys can be seen as a proxy for self-evaluation.[32] Our results show that medical students could not accurately assess their prescribing skills and competence, and suggest that they lack insight into their own strengths and weaknesses in prescribing. This finding is consistent with earlier findings showing that students have a relatively poor ability to self-assess their clinical and other skills.[9-16] This might be because self-assessment is complicated, context dependent, and influenced by many self-beliefs,[33] but also because self-assessment is not a quality that is given emphasis in medical education. Yet, accurate self-assessment is crucial for continuing professional development, and students should be able to identify their weaknesses in order to fills gaps in their knowledge. We suggest that more attention should be given to self-assessment during the undergraduate medical curriculum.

Interestingly, while the prescribing skills of the participating students were adequate, they seemed to lack confidence in two essential prescribing skills, i.e. "Verifying the suitability of the treatment for the patient" (Step 3b) and "Choosing the correct treatment" (Step 4). Recently, we found the same lack of confidence in these two "core" prescribing skills among final-year students at our institution.[8] A potential reason for this specific lack of confidence is that Step 3b and Step 4 can be considered as the most complex skills sets in the process of rational prescribing. Compared

to the other skills, Step 3b requires a much broader knowledge base and high order integrative thinking, such as recalling the contraindications, drug-drug interactions and other factors of toxicity that should be avoided in a particular patient. "Choosing the correct (drug) treatment" in Step 4 derives from and is dependent on Step 3. Another reason might be that these skills are not effectively addressed during undergraduate medical education at our institution. Although further qualitative research is needed to understand this unjustified lack of confidence in these core skills, students should be offered more experience and responsibility in prescribing to real patients in clinical practice to gain confidence in this area.[34]

Remarkable findings

Female students tended to underestimate their prescribing competence more than did male students. A similar trend has been observed in other studies investigating technical and surgical skills.[35,36] This might be because males are highly self-confident from childhood onwards, and several studies have shown males to score higher on self-assessment instruments.[37-39] Yet, this trend regarding prescribing skills was not statistically significant, and thus the weak correlation between self-reported confidence and measured prescribing competence cannot be ascribed to sex.

Another remarkable finding is that students felt more confident in "Writing a drug prescription" (Step 5a) than "Choosing the correct (drug) treatment for the patient" (Step 4). However, this is not surprising since Step 5a involves only writing a technically correct drug prescription (e.g., complete, legible), whereas Step 4 is a much more complicated cognitive skill (e.g., requires integrative thinking).

CONCLUSIONS

To the best of our knowledge, this is the first study to investigate the relationship between self-reported prescribing confidence and prescribing competence. Our study shows that medical students' self-reported confidence is poorly correlated with their actual competence. Thus self-reported confidence should not be used as the primary or sole measure of students' prescribing skills at the undergraduate level. Given the limited utility of self-assessment, future studies should focus on developing validated and reliable instruments to enable students to assess their prescribing skills.

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