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4th Research in Medical Education (RIME) Symposium 2015

Competency-based Medical Education: Changes and Challenges

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Book of Abstracts

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Fakultät für Medizin der Technischen Universität München (TUM)
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Conference presidents
Prof. Dr. Martin R. Fischer, MME
Prof. Dr. Pascal Berberat, MME

Scientific office
Dr. phil. Jan Zottmann
Dipl.-Psych. Ulrike von Wolffersdorff

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You find the online publication of this book of abstracts in the portal German Medical Science at http://www.egms.de/en/meetings/rime2015/.

Welcome

Dear Colleagues,

We welcome you all to Munich in the name of the Medical Faculties of Ludwig-Maximilians-University and Technical University to enjoy the 4th Research in Medical Education (RIME) Symposium 2015. The focus of this meeting will be on the chances and challenges of competency-based Medical Education. Participants from 10 countries will come to Munich to contribute their research results for a growing body of evidence to make informed educational decisions.

We are pleased to continue the RIME legacy that started 2009 in Heidelberg. The venue is held in association with the Master of Medical Education-Program of Heidelberg University and the German Association of Medical Faculties (Medizinischer Fakultätentag, MFT) as well as the Association of Medical Education in the German-speaking countries (Gesellschaft für Medizinische Ausbildung, GMA). RIME is the place to exchange and discuss cutting-edge research projects in Medical Education, to learn from international experts and to develop new ways to critically reflect on what we are doing every day: Trying to improve Medical Education for a better health care system. That is why we should take a closer look at student outcomes and competencies as the basis for postgraduate training and lifelong learning.

We wish you a successful meeting and hope for stimulating discussions and exchange!

Yours sincerely,

Martin Fischer & Pascal Berberat

Content

Key Note Lectures

01

The many research stories in Medical Education

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Research stories are like the One Thousand and One Night's Fairytales - they represent a blend of genres such as historical tales, anecdotes, love stories, tragedies, comedies, crime and horror fiction, etc.

A key similarity of research stories and One Thousand and One Night's Fairytales is their 'cliffhangers' - i.e. each story ending with new research questions - leaving the audience with a wish for more and hence a reluctance of executing the storyteller.

Drawing upon some of the contemporary topics in medical education this presentation will tell some stories about how research contribute to questioning our intuitive assumptions, building theories and is of help in finding out why and how what works for whom. Finally, the presentation will include some reflections on future perspectives related to the field of medical education research.

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02

The competency-based movement: A global perspective

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Over the past two decades there has been an international movement toward competency-based medical education. Specific, measureable competencies have been identified and learners are expected to work towards them until they are achieved. Competency-based educational programs will be learner-centered and outcome-focused. Time, as a measure, will have decreased importance, and training length may increase for some learners and decrease for others. In support of this movement, many countries and institutions have created lists of "competencies" that summarize the fundamental knowledge, skills, and abilities that are required. More recently, this movement has been embellished with the creation of "milestones" and "entrustable professional activities".

Competency-based education achieved international prominence in an article by Frenk et al. [1] in *The Lancet*. In the traditional model of education, objectives are defined within the context of the academy and assessment is directed at ensuring that those objectives are met. In the competency model, the health care needs of the community serve as the foundation. These needs define the competencies and outcomes which, in turn, determine the curriculum and assessment. Through this model, students acquire the skills and procedures needed most by the community.

This plenary session will trace the history of the competency-based education movement from its roots in elementary and secondary education to its current application in medical education. Global perspectives, specifically those of Canada, Europe, and the United States will be offered as will developments supporting their rationales. Central to the success of competency-based education is assessment and this session will highlight some of the challenges it faces.

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03

Diagnostic competence: Sources of cognitive diagnostic errors and strategies to improve clinical teaching

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A major goal of medical education is to develop in its students the knowledge and skills enabling them to diagnose clinical problems. Diagnostic competence depends largely on achieving a high level of mastery in diagnostic reasoning, the thinking and reasoning processes through which a physician gains an understanding of his or her patient's problem. Research on diagnostic error has indeed shown that diagnostic reasoning critically defines physicians' performance and the quality of care provided to their patients. The US Institute of Medicine for instance reported that up to 98,000 people die annually in the US due to preventable medical mistakes, a large proportion of them involving diagnostic errors [1]. Many diagnostic errors may be corrected in time or produce minor effects, but a substantial fraction is likely to have serious consequences. A recent study of autopsies in the Netherlands found discrepancies in the major diagnosis in 39% of the cases, and in almost half of them treatment might have been different if the correct diagnosis was known [2]. While multiple factors may interact to produce diagnostic errors, most of these errors derive from physicians' faulty reasoning [3], [4]. In fact, a study of diagnostic errors in American academic hospitals showed flaws in physicians' cognitive processes in 74% of the cases [3]. Most of these flaws were produced by faulty reasoning rather than by lack of knowledge. The sources of faulty reasoning and how to counteract them have been a source of much debate but scarce empirical investigation. In this talk I will

1. describe empirical findings from research on the effects of different forms of diagnostic reasoning on the quality of diagnostic decisions,
2. examine factors that influence physicians' reasoning mode and may lead to cognitive errors;
3. describe empirical findings of interventional studies aimed at fostering learners' diagnostic competence.

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04

International recognition of accreditation for quality assurance of medical education

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High quality in medical education is a prerequisite for quality in health care delivery. The increasing global mobility of patients and health care personnel further underlines the need for quality assurance of medical education. But most importantly, accreditation should stimulate quality development. While accreditation must be undertaken by en independent, external organisation, quality development is primarily an internal responsibility of the individual institution or university.

To be internationally trustworthy, medical education institutions should undergo accreditation by internationally recognized national or regional accrediting bodies, with a legal status in that country or region. The World Federation for Medical Education (WFME) offer global standards and guidelines for quality assurance and quality development as well as an internationally established and transparant procedure for recognition of established accrediting organizations. This will promote recognition of accredited medical education institutions worldwide and universal acceptance of diplomas issued from those institutions. As a complement to formal accreditation, WFME together with the FAIMER Institute in US has developed a web-based Directory of Medical Schools, with validated information about more than 80% of the worlds medical schools, including accreditation status.

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05

Scientific reasoning and argumentation – a general key competence?

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The ability to reason, argue and act on scientific grounds is important in a number of everyday and professional contexts. In the medical context, for example, doctors need to ground their reasoning process in scientific (bio-)medical knowledge to arrive at adequate diagnoses and treatment decisions. In a similar way, competent high school teachers design classroom instruction in accordance with theoretical approaches and empirical evidence from research on learning and instruction, rather than on pure intuition. To what extent professionals approach problems from their professional practice on scientific grounds may partially depend on their internal problem-solving scripts (i.e. their expectation of how a typical problem-solving process in their domain looks like). Such internal scripts can be assumed to differ between experts and novices within a domain, both with respect to the kinds of activities experts and novices regard as typical for a problem-solving process, and with respect to the quality of these activities. For example, while a competent teacher may view the search for instructional theories or concepts as a necessary step of his or her lesson planning, the internal problem solving script of a less experienced teacher may not include such a step. In the medical context, both doctors and students may regard the search for (bio-)medical concepts as a necessary step in the diagnostic process, but experienced doctors may perform this search at a higher quality level. In my talk, I will present and discuss a generic theoretical model of the scientific reasoning and argumentation process that holds some promise when it comes to the identification of the "scientificness" of experts' and novices' internal problem solving scripts and apply it to the medical context. Then, I will discuss to what extent this model can also be used to conceptualize the scientific quality of internal problem-solving scripts in other disciplines and lay out at what points domain expertise is crucial for the analysis of problem-solving scripts within a certain domain. In the final part of my talk, I will derive implications for the design of instruction targeted at the facilitation of scientific reasoning and argumentation, both within and beyond the medical discipline.

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Short Communications

Session 1 A – Learning & Skills

06

"I only stand around and look friendly" – Identifying deficits in medical students' ward round scripts

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Background: Ward rounds represent a crucial activity in physicians' daily practice in hospital. However, medical curricula lack adequate preparation for this task, and students report difficulties in performing and understanding ward rounds properly. We aimed at identifying differences in ward round scripts [1] between medical students and more experienced physicians. Differentiating between scenes (individual expectations regarding phases of a ward round), roles (participants) and scriptlets (activities) [2], we examined scriptlets with regard to

1. their content (medical, social, administrative, teaching and learning) [3] and
2. potential for knowledge construction (interactive, constructive, active, passive) [4].

Methods: We conducted standardized interviews with N=50 medical students and physicians at different expertise stages at a University Hospital using the structure formation technique [5] to map individuals' scripts.

Results: While scripts of individuals at different expertise stages showed a high similarity on a superficial level, in-depth analysis of scriptlets' content and potential for knowledge construction revealed significant differences between groups: residents mainly mentioned activities bound to patient care, while students and more experienced physicians also perceived teaching and learning activities as typical for ward rounds ($H(3)=7.128$, $p<0.01$). In terms of activities' potential for knowledge construction, stu-

dents reported significantly more passive activities than all other groups ($H(3)=18.25$, $p<0.001$), whereas residents reported significantly more active activities than other groups ($H(3)=9.71$, $p=0.02$).

Discussion: Our study detected expertise-related differences in scripts: residents did not perceive teaching and learning activities as typical for ward rounds. Given students' deficits in understanding rounds as encounter for knowledge construction this conception is especially fatal, when preparing students for conducting rounds. It is not only necessary to support students to recognize activities at higher levels of knowledge construction and to understand themselves as active ward round participants. Moreover, there is a need to facilitating residents to understand ward rounds as encounter for teaching and learning.

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07

How to become a good physician? A qualitative cross-sectional study to assess existing key competence and perceived needs of medical students and young physicians

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Introduction: Key competences gain more attention in curriculum planning at medical faculties. There are studies and recommendations, where experts point out, which kind of communicative and social competences a student should know at the end of his clinical studies, e.g. CanMEDS [1]. However, less is known how medical students and young physicians themselves see their skills and needs. The aim of this study is to assess their view on acquired key competences and to analyse their further needs in the transfer phase from medical school to residency. This should be the ground for the development of a postgraduate training curriculum.

Methods: We conducted six different focus groups with medical students just before and in the pratical (final) year of medical school and young physicians in their first half of their residency. 29 students and doctors from the TUM School of Medicine were included in the focus groups. We assessed their general view on key competences, how they perceived medical education in this area and their corresponding needs for more training. The transcripts of the focus groups were qualitatively analyzed according to Mayring [2].

Results: Preliminary results show the need for more communication skills and management skills in running a ward. By the time of the conference more results will be presented. We will contrast the results with recommendations of „expert-studies".

Discussion: The results will give a new perspectives on the topic of education in key competences for young physicians in the sensitive transfer phase from medical school to residency. It will help suitable curricula developments in under- and postgraduate training.

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08

Systematic viewing in radiology: Effects of a training

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Introduction: In the medical domain, expertise requires the ability to examine complex, information-dense, visual material. Such visual material poses challenges; especially inexperienced individuals face difficulties as they are distracted by visually salient information instead of attending to thematically relevant areas [1]. We still know little about how the perceptual and cognitive system develops and how the learning process can be improved by training. A study is presented in which the gaze patterns and diagnostic skills of medical students before and after training in radiology were analysed to explore how they transform their knowledge.

Method: An experimental design with pre- and post-test was used. The experimental group participated in the training, while the control group did not 34 medical students in the clinical phase participated and they were equally distributed among the groups. A remote eye-tracker with a temporal resolution of 50 Hz and a spatial resolution (dispersion) of 1.0° visual angle was used. The subjects had to study 30 authentic x-ray images and decide whether a pathological finding was present and if so which one. Eye movements as well as verbal data were collected.

Results: Results show differences in pre- and post-test. In the post-test, students were more confident in their decision making and their diagnostic performance improved. Confidence and performance correlated significantly. However, the verbal data show that students faced difficulties in accurately naming the disease. No differences were found regarding time of inspection. The eye movements did not change significantly after training.

Discussion: Although the training has improved students' performance, we do not yet see differences in their visual behaviour. At the conference, we will discuss these findings and explain how the combination of eye movements and verbal data can improve our understanding of cognitive and perceptual processing and help us improve learning environments in medical education.

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09

Can differential competency acquisition be predicted at student selection?

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Introduction: Doctors with different personalities tend to develop different competencies [1] and choose different primary-care or specialised careers [2]. These tendencies may partly be anticipated during admission to medical school [2].

Aim: To examine the detection of differential competencies in medical school applicants.

Methods: Two approaches were used:

- Analysis of the results of a nationwide survey on the Test for Medical Studies (TMS; n=2915; TMS participants: n=1903)
- Analysis of a survey among medical program starters (3 cohorts, n=384) with respect to their eventual performance in courses and OSCEs reflecting different competencies

Results:

- TMS survey: Different participant subsets occupied the upper quartiles with respect to the school-leaving grade and to the scores in the verbal-mathematical and the visual-spatial part of the TMS, indicating different innate cognitive competencies. Sciences, mathematics, and economics as main school subjects predicted success in the verbal-mathematical part of the TMS. Music and arts predicted success in its visual-spatial part.
- Starter survey: Students without parental financial support generally performed less well than others but had advantages in OSCE tasks pertaining to knowledge application and manual performance. They were mostly older students with inferior school-leaving grades but previous vocational training. Children of non-academic fathers had an advantage in communicative OSCE tasks, whereas children of academic mothers had an advantage in manual tasks. Different reasons for studying medicine (altruistic, extrinsic) except for interest in sciences did not predict differential performances.

Discussion: Medical school starters may have different cognitive and non-cognitive abilities and eventually they may develop different competencies. Their competencies may be influenced by the familial and school background and can at least in part be detected in the selection process. This should be considered in the development of admission instruments targeting at diversity. Furthermore, curricular competency training should be adapted to the diversity of the students with respect to their innate tendencies.

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10

Fostering medical competencies through vicarious learning: Effects of collaboration scripts on physical examination skills

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Simulations with standardized patients can foster knowledge acquisition in medical education. Often only one student can perform such simulations at a time. Offering students to observe the simulation and provide peer-feedback might enhance the effectiveness of the simulation. Collaboration scripts were used as instructional approach to support the learners. According to the Script Theory of Guidance (SToG), collaboration scripts specify, distribute and sequence activities of collaborative learners. In a study with N=66 medical students we varied an observation script (with vs. without) and a feedback script (with vs. without). We examined the effects on the competencies regarding the rectal exam. An observation script specified a list of important features the observer should focus on. A feedback script provided guidelines how to provide helpful feedback. The learning phase was segmented into three phases: First, the student in the examiner role performed the rectal exam while being observed by the observer. Second, while the examiner receives feedback from the standardised patient, the observer prepared feedback for the examiner. Finally, the examiner received feedback from the observer. Results show that the observation script (but not the feedback script) had a positive effect on performance of the observer. There was, however, a general effect of feedback: Despite the fact that students in the examiner role did not had direct contact with the observation script, a positive effect of the observation script on their competence was found. Post-hoc comparisons with students without an observation prior the simulation session showed that only dyads supported by the observation script outperformed learners without the opportunity to observe the rectal exam. This study shows that observation of simulations and giving feedback can enhance performance of learners in a context in which the observer will perform at a later time, but only if supported by an observation script.

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11

How to run a ward round in internal medicine – an Entrustable Professional Activity (EPA)

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Introduction: Despite their importance, ward rounds only attract little attention in medical education. As a consequence, medical students and junior physicians report difficulties in performing them properly [1], [2]. To overcome this lack, this study aims at identifying competencies and activities relevant for running a good ward round in internal medicine. In a second step, these competencies and activities are integrated into an Entrustable Professional Activity (EPA) [3] that can be used for teaching, and assessing individuals' performance in both undergraduate and postgraduate medical education.

Methods: We conducted an interview study with N=26 experienced physicians and nurses working at our University Hospital and belonging Academic Teaching Hospitals. The sample accounts for the broad range of hospitals. Through content analysis of interviews, competencies and activities relevant for ward rounds could be mapped.

Results: Data analysis identified eight competencies as essential for performing ward rounds: communication with both patients and team, collaborative clinical reasoning, organizational competence, self-management, capacity for teamwork, problem solving, dealing with errors. Professionalism, empathy, patient management, clinical skills, teaching competence, technical knowledge and communication with relatives were also reported as necessary for conducting ward rounds. We could assign multiple activities to these competencies. Based on these results, we developed the EPA „Running a ward round in internal medicine".

Discussion: Data provide a sophisticated overview of competencies and belonging activities relevant for conducting good ward rounds. The EPA will be implemented and validated within a ward round training at our faculty that strives for preparing medical students already at an early stage for this crucial task of their future daily routine.

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Session 1 B – Assessment

12

Objectivity of written assessments: an approach to evaluate this criterion

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Introduction: Objectivity is most the fundamental of the criteria for the evaluation of assessment quality, although it is rarely examined. Based on the specific organization of the medical study programme at Hannover Medical School (MHH) we are able to comparatively test many of our module exams in respect of this criterion. The annual cohort of students is divided into three sub-cohorts (called „tertials") which rotate against each other. Each module exam is therefore conducted three times in the academic year.

Methods: We selected every written exam in medicine within the last four years at MHH where the cohort has been split up into three tertials. The grouping is triggered by student preference. Because the curricula for these subjects are exactly identical in the three tertials, the distribution of grades should vary only randomly if the exams assess the students is the same way.

Distribution of grades was tested between these three exams per academic year with MANCOVAs. The modules were the covariate, while the selected years and the tertials were the independent variables. In a second step the exams of each year were separately compared.

Results: In the first MANCOVA the covariate (modules) had a significant effect, whereas there were no significant main effects for years and tertials. Because the significance level was only scarcely missed, separate MANCOVAs were performed for each year. Contrast analysis of the complete model and the MANCOVAs for each year show that there was a difference between the first three years and the last.

Discussion: The objectivity of exams is more fundamental than reliability and validity. The proof of its existence is a conditio sine qua non for the performance of a rotation in a curriculum. Our results show that it is possible to inspect this criterion for a whole study programme as well as for single modules.

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13

Workplace-based assessment in general medicine: experiences at LMU Munich

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Introduction: Until recenty summative tests were realized mainly as written examinations or as structured practical examinations [1], [2], [3]. With respect to their relevance and validity for clinical practice workplace-based assessments [4], [5] are as well a desirable format, since they are carried out in a real clinical setting. Since the winter semester 2012/13 in the 2 week internship of general medicine at the LMU Munich structured work samples are used for marking.

Question: Is the workplace based examination in general medicine training a suitable measuring instrument for detecting clinically relevant skills?

Methods: 618 evaluation sheets from 164 interns from winter 2012/13 to winter semester 2013/14 were evaluated. The rating forms contained items for a total of 11 criteria in four relevant clinical situations (acute case, chronic case, prevention/screening and technical examination) and a global behavioral rating.

Results: The report includes the results of 611 students. The scoring exhibits a clear ceiling effect: From a maximum overall score of 32 points on average 31.48 points were reached (range 23-32, Cronbach's α=0.57). The most commonly performed technical studies were ECG (246), sonography (168) and pulmonary function test (52). Also in the technical investigation ratings on average 4.86 out of 5 points were achieved.

Discussion/Conclusion: The result suggests that the examination is seen by the general practiitioners as formative assessment rather than as a summative test. A feedback of results to the teaching doctors and a training for the grading of the observations are planned to improve the reliability of the test. The announcement of the assessment and the rating forms included in the students' logbooks point out the importance of practical skills to the students and foster the teaching of those skills by the general practitioners.

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Empirical Structure of a Competency-Based Progress Test

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Introduction: In 2013 a formative competency-based written Progress test (144 MCQs) was developed. Items were constructed based on a two-dimensional blueprint. The first axis consisted of eight clusters of medical disciplines according to the German State Exam; the second axis consisted of five competency domains: theoretical clinical, practical clinical, communicative, scientific and professional behavior competencies. For each combination, the number of items was fixed corresponding to the blueprint [1]. The first progress test was carried out in November 2013; the second one will be run in November 2014. On this second progress test, 20 MCQs will be substituted with situational judgment items.

To provide meaningful feedback for students and faculties regarding test results on competency domains, sufficient reliability and discriminant validity of these domains are required. The aim of this study was to empirically analyze these properties of the competency domains.

Methods: Reliabilities of the competency domains were estimated by the coefficient “glb” [2]. To establish the discriminant validity of the domains, a discriminant analysis of principal components [3] of the data was conducted (“one against the rest” and multiclass discriminant analysis).

Results: All domains showed a high reliability for the 2013 data. The discriminant validity of the scientific competency domain was high. Theoretical clinical and practical clinical competencies could not be separated from each other, but differed significantly as a group from the other domains. Communication and professional domains showed a moderate independence and were significantly different from clinical and scientific competencies.

Results of the second progress test in November 2014 will also be presented.

Discussion: Items of the clinical competency domains, communication/professional competence, as well as scientific competence could be verified as three reliable and distinct clusters. With improved classification of the items, all five competency areas can be proved to be different constructs.

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15

Are alumni surveys an appropriate tool to detect curricular changes? Two cohorts from Hannover Medical School evaluate study conditions and assess their competencies

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Introduction: In 2005, Hannover Medical School (MHH) implemented a model curriculum (HannibaL) that defines the personal contact with patients and their diseases as a key training element and reinforces the link between basic sciences and clinical expertise. Since 2010, all graduates have been asked to fill-in a questionnaire to trace the curricular outcomes [1]. The young physicians shall evaluate among other aspects study conditions as well as their own medical competencies. In 2013, the first HannibaL cohort was surveyed.

Methods: The questionnaire and its adoption for medical schools were developed within the framework of an alumni study network of 50 German universities. All medical students from MHH were contacted 1.5 years after graduation. Results from 2010, representing a cohort with little contact to the new curriculum, and 2013 were compared with regard to the evaluation of the study conditions and the self-assessment of competencies. Competencies were measured by means of the Freiburg Questionnaire to Assess Competencies in Medicine (FKM) [2]. Participants were asked to rate their level by the time they graduated and the extent to which these competencies are required in their current job.

Results: The response rate was 54% in 2011 (N=154) and 48% (N=117) in 2014. On a 5-point scale (1=very good, 5=very poor) HannibaL students rated teaching of communication skills significantly better than the cohort of 2011 (e.g. "Training for passing on information to patients"; M=3.16 vs. M=3.96, p<.0001, Cohen's d=0.8). The use of modern didactical elements was also ranked higher (M=2.91 vs. M=3.62, p<.0001, Cohen's d=0.7). In contrast, self-assessed communication skills have not improved.

Discussion: Improved evaluations for communication trainings seem plausible. The fact that self-assessed competencies in this area have not improved in the same way needs further investigation. The results point to the complex character of self-assessments. Additional criteria to evaluate competencies adequately are therefore necessary.

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Quality of student-generated MCQs

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Introduction: The creation of high quality multiple-choice questions is generally seen as a task of medical experts / lecturers. But in the area of formative tests, students can participate in the creation of multiple-choice questions, and there is evidence in the comparison of questions from students and lecturers that both can be equivalent [1], [2], [3]. The present study shows a comparison of multiple-choice questions from students and lecturers.

Methods The quality of student-generated MCQs, which were created by trained students for a formative student Progress Test [4] of 2013 (n=144) and 2014 (n=120) was compered to MCQs of lecturers (n=400) from summative examinations in the subjects internal medicine, surgery, anatomy/biochemistry/physiology of the years 2013 and 2014. The MCQs were analyzed with respect to their quality in the post-review, which included statistical criteria (part-whole corrected discrimination and item difficulty) and a substantive review. The proportion of corrected MCQs and the proportion of excluded MCQs due to the post-review, as well as the reliability and the standard error of the exams were used as quality measure for MCQs.

Results: There was no difference between student-generated MCQs and MCQs generated by lecturers. For the student-generated MCQs from the year 2013 the proportion of corrected MCQs was 3.47% and the proportion of excluded MCQs was 2.78%. (The data for 2014 are presented in the lecture.). For the MCQs generated by lecturers the proportion of corrected MCQs was 3.25% and the proportion of excluded MCQs was 2.50%.

Discussion: Provided a comprehensive training, students can make an equivalent contribution for formative tests as lecturers.

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Differences in self-judgments of history-taking performance between high and low performing students

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Introduction: Although trainings improve students' communication skills, they still have difficulties in communicating skillfully in clinical settings [1]. It has been proposed to explain this lack of transfer as a problem in metacognitive processing. Using unsuitable cues for monitoring actions in a complex situation prohibits effective behavior adaptations and thus competency development. It has been shown that in monitoring history taking students use cues such as observable behavior emitted from patient and student (OB/P/S), information in student's memory (IM) and student's subjective feelings (SF) and proxy judgments (PJ) emerging out of the experience of performing [2]. To learn about cues suitability we hypothesize in accordance with literature [3] that students performing high in the skills domain differ in their usage of cues compared to students performing low. As defined by communication models [4] we hypothesize that high performing students will use more patient-emitted cues in monitoring their behavior.

Method: Forty second year medical students in first consultation skills training verbalizing their metacognitive self-judgments using their last training patient encounter as stimulus material. This material was analyzed using directed content analysis.

Results: 40 Students selected 144 sequences to provide self-judgments. Those contained 259 expressions elaborating the self-judgments. Coding dimensions and codes as previously

defined proved to be applicable to the extension sample. Preliminary results indicate that high performers provide not only more expressions to elaborate their self-judgment but also integrate more cues into their elaborations. They also indicated more sequences to judge their performing of a process skill, and they use patient emitted cues for deriving their judgments twice as much.

Discussion: Results signifies patient-emitted cues as suitable cues for deriving a metacognitive self-judgments of one's performance in communicating with patients. If stimulating their usage will help low performing students to improve have to be shown by further research.

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Session 2 A – Communication and Social Skills

18

(Assisted) decision-making in mental health

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Introduction: I am addressing the question how decision-making of people with (mental) health issues can be successful. I argue that assisted decision-making in mental health is often the best way to secure that the interests of the patient are best valued.

Method: For this purpose I conducted semi-structured interviews with mental health consumers, their relatives and professionals in 2013/2014.

Results: It turned out that there are several things that professionals, relatives and peer supporters can do in order to assist people with mental health problems in decision-making: They can give hope, they may contribute to individual and collective empowerment [4], they can guide patients on their way to recovery [1], e.g. by sharing their knowledge from experience with the patients.

Discussion: The issue of assisted decision-making in mental health has high clinical and also juridical relevance, since assisting (mental) health patients in decision-making may not mean taking over control and deciding for the patient [2]. The difficult topic of coercion and violence in mental health has been discussed recently [3] as well as issues of trust and collective autonomy [5].

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"Difficult clinical cases" as perceived by undergraduate students during their internship year: quantitative distribution according to CanMEDS roles

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Introduction: During internships students frequently witness clinical situations in which routine medical algorithms are not sufficient to solve the problem. This forms a challenge for clinical teaching, since there is often no time, or awareness, to work up these situations. Furthermore, by overseeing these situations important teaching opportunities might be missed. Only little is known about the nature of respective situations and how they are related to CanMEDS roles. For our research we intentionally defined the term "difficult clinical case" in a broader fashion, including potential underlying causes outside the specific medical problem (e.g. communication within teams, resource shortages, ethical dilemmata). With better insight into the problems perceived by students, we might be able to design more adequate preparation for internships and provide information for clinical teachers in regard to CanMEDS roles.

Methods: The University of Zurich implemented a new learning format to reflect physicians' roles within the 6th year of undergraduate training (total cohort: n=240). As a fundamental element of this course each student submits a "difficult clinical case" of 150-300 words from his own internship experience (to form the thematic basis of the course). We performed qualitative analysis of these case vignettes, relating to the seven CanMEDS roles.

Results: The preliminary analysis of 10% of the collected material showed a wide distribution of difficult clinical cases reaching from "access to health care" over "communication challenges" and "interprofessional communication" to "shared decision" and "palliation". Leading CanMEDS roles addressed within the case vignettes were "professional" (approx. 35% of cases), "communicator" (25%), and "health advocate" (20%).

Discussion: "Difficult clinical case" vignettes from internships may serve as a rich resource to identify teaching gaps and opportunities, and to design preparation formats for students before their internships. More elaborate results will be available at the time of the RIME conference 2015.

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Integration of a mandatory reflective learning format based on CanMEDS roles into an undergraduate medical curriculum

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Introduction: Many undergraduate curricula provide no or little learning formats for the reflection of physicians' professional roles, especially for the work-up of experiences during internships. In order to provide an opportunity for this, we sought to implement a respective learning format directly after the internship year (5th year), in the 6th year of the medical curriculum at the University of Zurich, Switzerland.

Methods: Following literature review, three working group rounds of expert discussions were performed involving all stakeholders. Written notes were circulated after each discussion to stimulate the following round. Subsequently, a writing group prepared a proposal for critical appraisal by the working group.

Results: The working group decided on a blend of learning formats including (a) workshops (n=6; duration 2 hours; 16-18 students), (b) lectures / panel discussions (n=4; 2 hours; total cohort), and (c) self-directed student groups (n=3; 2 hours; 6 students) to be held weekly over one semester. Workshops were to be led by highly experienced clinicians, lectures on topics around different physicians' roles were to be held by declared experts in their fields. For the workshops each student had to submit one specific vignette of a "difficult case" from his own internship time. A "difficult case" was specified as a case which could not be solved by the use of typical medical algorithms (CanMEDS role "medical expert"). The suite of workshops was composed around the cases which had been submitted to the clinician educators in advance. During the term each student was to enrich his case vignette by the concepts, ideas and potential solutions derived from workshops, self-directed student groups, and lecture formats. The final vignette would serve as formative assessment tool.

Discussion: During the autumn term in 2014 this learning format has been implemented, and first evaluation results will be available at RIME conference 2015.

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21

To know or not to know? The ability to reflect knowledge gaps does decrease during studies

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The German Progress Test Medicine (PTM) is designed to test the development of knowledge during undergraduate medical education [1]. The tests are at graduation level. Anyhow, the students take them regularly from beginning and progressively perform better. Each PTM is composed of 200 Multiple-Choice – Items Type A which include a „Don´t know"-option. Incorrect answers are penalized (-1 score). The students need to correctly identify gaps of knowledge in order to score as high as possible [2]. MCQ Tests with positive marking are known to promote guessing [3]. In this first explorative study we aim to investigate in which way the „don´t know"-option is used by the students as they progress in their studies and what does that tell us about their ability to correctly identify nescience.

Hypothesis:

1. The more the students know, the more items they get correct
2. The higher their ability to identify nescience, the more they use the "don't know"-option AND the less they answer incorrectly.

We analysed 3,359 test results from 2009 – 2014 of students from semester 1 – 9 at Witten/Herdecke University. We compared their mean results and could see an increase of right answers from 7.2% to 41.5% and a decrease of „don´t know" answers from 89.2% to 44.6%. At the same time the ratio of wrong answers increased from 3.6% to 13.9%.

Whereas the increase of correct answers and the decrease of "don't-know"-answers are as hypothesized in line with their progress, the increase of wrong answers needs further investigation. If this bases on a culture of not reflecting knowledge gaps and this behavior is fortified during studies this certainly is something to worry about. It seems reasonable to give specific feedback and to start thinking about new ways of the evaluation of nescience and guessing also in summative assessments [4], [5].

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Experienced physicians' perspective on junior doctors' learning at the workplace: Does social interaction in clinical activities lead to a gaining of competence?

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Introduction: As medical schools cannot prepare junior doctors for every aspect of their professional clinical work [1], junior doctors have to acquire the "tacit knowledge" necessary to show efficient performance through engaging in the social context of work [2]. However, little has been published on how junior doctors actually learn in the clinical workplace [3].

Methods: An interview-study with N=9 internal medicine specialists (8 to 35 years of clinical experience) in rural and university hospitals in southern Germany was conducted in 2014 to assess the specialists' perspective on junior doctors' learning at the workplace. Eraut's model of early career learning [4] and Teunissen et al.'s framework of residents learning in the workplace [5] informed the development of the interview guide. A literature based coding-scheme was used in an inductive-deductive approach to analyse the data.

Results: We identified social relations in the workplace, personal knowledge and the structure of work as factors related to junior doctors' learning in the workplace. Preconditions for interaction (e.g. availability of interaction-partners, fear-free environment), content of interaction (e.g. advice, feedback, support) and status of interaction-partner (e.g. superior, peer, nursing-staff) emerged as sub-categories within the theme of social interaction. The results suggest that different contacts relate to different learning needs. They help junior doctors to set their experiences with clinical activities into perspective and facilitate their professional development.

Discussion: In order to foster clinical performance, the social integration of junior doctors and their interaction partners at the clinical workplace needs to be better understood. A social network analysis approach might be helpful to broaden the insight.

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Does structured feedback improve communication skills of medical students? And who benefits most? RCT about an innovative optimized training course

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Introduction: Communication skills can be improved by specific training (CST). Up to now, it is unclear, whether the didactic element of a structured and behavioral orientated feedback is responsible for this improvement.

1. Does a structured feedback improve communication skills of medical students?
2. Who benefits most from an innovative training course?

Methods: 66 medical students participated in a research orientated CST after informed consent. All were randomized in a training as usual (control group CG) and a training with optimized feedback (intervention group IG).CG focused on practice and experience, whereas IG integrated a precise behavioral feedback from actor patients, feedback from peers who were asked to fill out an observational questionnaire and a summary of the trainer with recommendations for improvement. All students had a pre and post assessment with standardized patients (SP), which were videotaped. Blinded raters rated these videos by using a checklist known from other RCT. Selfevaluation and evaluation by SP was assessed. Additionally, questionnaires about self competence were handed out pre and post. Manova is calculated to compare differences between training and control group for significant changes. Subanalysis was processed to research subgroups who benefitted most.

Results:

1. The IG shows middle to big size effects analyzing objective video ratings. 5 out of 7 cluster of communication skills became significant comparing pre and post assessment. Comparing IG and CG was not advisable, because randomization has not worked. Using multitrait-multimethod, we can show that self evaluation and evaluation by SP became more congruent.
2. Low performer improved significantly more than high performer. More results will be presented by the time of the conference.

Discussion: This study provides information about a didactic concept of how communication skills can be taught. It can trigger discussion of how to optimize teaching methods in communication skills.

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Session 2 B – Technology-enhanced Learning

24

Technology-enhanced lecturing: How students perceive the move from the traditional approach to a blended learning format

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Introduction: The didactic lecture continues to be a commonly used instructional method in medical education despite the criticism of allowing students to assume a passive role. With new technology, this traditional approach may be redefined by combining it with online activities. The aim of this research is to investigate how this can be done to enhance student learning.

Methods: A 30-hour anatomy lecture was redesigned into a blended learning format of 6 sequential organ-based modules. 23 hours were allocated to f2f instruction, 7 hours to online activities, including preparatory fill-in-the-blank assignments, clinically related videos, and mc-quizzes for each module. To investigate students' study behaviour and perception of learning, 3 focus-groups were conducted and thematically analysed.

Results: Students reported that online activities "pushed them towards a first engagement with the material", videos "generated curiosity", quizzes "made them think". The familiarity with the basics liberated them from the "worry of missing something important" during f2f instruction, facilitating active participation and "deeper understanding". Self-study before the examination was described as "easier and faster", participants stated that "contents would remain for a longer time in memory".

Discussion: The findings indicate that preparatory online work can prevent students from being passive recipients of information during lectures. Students engaged more actively, more deeply, and over a longer period of time with the course material, thus indicating enhanced learning on the parts of the students. Further research is needed to validate the findings with diverse samples and across various institutional settings. We suggest that research then focuses on quantifying long-term retention of information taught in technology-enhanced lectures in comparison to the traditional approach.

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Video-based self-reflection: a new tool in an innovative teaching concept concerning interprofessional collaboration

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Introduction: Legal regulation call for „Interprofessional resp. interdisciplinary collaboration" of several health professions. Nevertheless, this educational assignment is rarely implemented in current curricula. At the University Hospital Jena, we developed a novel and innovative constructivist-based teaching concept. we selected an interprofessional treatment situation from the field of early rehabilitation medicine as learning opportunity.

Methods: The teaching concept consists of 4 steps:

1. Reactivation of knowledge regarding disease, early rehabilitation and communication,
2. experiential learning exercise: controlled experience of interprofessional treatment situation (= learning opportunity) in a role play with chance to change perspective,
3. structured reflection of the own performance based on a video record of the role play,
4. purposeful transfer of the reflection into one`s own daily professional behaviour.

Based on this concept, two classes, a seminar for students and a workshop for teachers, have been developed.

The core element of this innovative teaching concept is a new didactic tool: the interprofessional role play with "video-based self-reflection". The participants were divided into small groups, to produce a training film of a selected treatment situation, in our case the mobilization of a patient with an insult respectively after hip joint replacement.Subsequently the participants were encouraged to reflect their professional, interprofessional and communication performace and to transfer the new insights into their daily professional activities. Evaluation focussed on the assessment of personal growth and increase in experience and was obtained in writing and during informal discussion.

Results: Overall 31 trainees of two health professions and 19 teachers took part. Both classes received positive evaluations in terms of a high individual increase of experience and insight through the use of the new tool "video-based self-reflection" in the interprofessional training.

Conclusion: The constructivist teaching approach including the use of the role play with following video-based reflection represents a very unique individual learning opportunity resulting in a high subjectively perceived increase of experience and insight.

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Experience with Video-Based Self Control in surgical education: An innovative but technically demanding concept

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Introduction: Teaching and learning surgical skills is frequently taking place in skills labs or practical courses. The learning process depends on the interaction with the experienced tutor. The key feature of our concept is the video and image-documentation of each exercise as a basis for self-analysis of process- and result-quality following the principles of PDCA-cycle. The aim of this study was to evaluate potential and limitations of the video-documentation and subsequent analysis of each exercise.

Methods: Every student was asked to videotape his/her performance during each exercise and photo-document his/her result using their own smartphone or Tablet-PC. The students were instructed to perform a detailed criteria-based analysis of their process- and result-quality. They were asked to upload their results into a digital-platform for later evaluation by the instruc-

tors. Persistence of the learning effect was assessed during a test 6-12 weeks after the course. Students experience with this concept was evaluated in an open feedback discussion and by an online survey.

Results: The new teaching concept was applied from 2011-2014 in a practical course with totally 119 students. Result-quality was very high and long-lasting. The process-quality was more difficult to achieve. The oral feedback (119/119) revealed that all students were satisfied with their learning increase. The photo-documentation compliance reached 98% (117/119) from the beginning. The video-recording compliance increased in parallel with the increasing availability of smartphones and Tablet-PCs and reached 100% in the last class. The compliance to work with the videos was related to the ease of use. Students were principally willing to upload their documentation and video into an electronic platform, but realization was dependent on the ease-of-use.

Discussion: The new teaching concept is highly effective and leads to a long lasting learning effect. It is principally well accepted by the students. Implementation would strongly benefit from standardized technical-equipment and an easy-to-use high-volume-electronic-platform for an interactive evaluation.

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How do “digital natives” learn pharmacology? A prospective cohort study on the use of learning media by undergraduate medical students

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Background: The omnipresence of the internet and computer-based technologies has an increasing impact on higher education and the way students access information.

Aims: To investigate the use of digital and non-digital learning resources by undergraduate medical students.

Methods: Daily online surveys and semi-structured interviews with 3rd year medical students during a pharmacology course.

Results: Students predominately used digital over non-digital learning resources (69±7% vs. 31±7%; p<0.0001). Most used media for learning were lecture slides (26.8±3.0%), apps (22.0±3.7%) and personal notes (15.5±2.7%), followed by textbooks (>300 pages) (10.6±3.3%), internet search (7.9±1.6%) and e-learning cases (7.6±3.0%). When comparing learning media use of teaching vs. pre-exam self-study periods, textbooks were used significantly less during self-study (-55.2%; p<0.001), while exam questions (+334.2%; p<0.0001) and e-learning cases (+176.2%; p<0.0001) were utilized more.

Conclusions: Both quantitative and qualitative data revealed a high prevalence and acceptance of digital learning resources by undergraduate students in pharmacology, in particular mobile applications.

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Students‘ use of e-learning in undergraduate palliative care education (UPCE)

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Background: Undergraduate palliative care education (UPCE) became mandatory in German Medical Curricula by 2013. The aim of this survey was to examine students’ acceptance of an innovative interprofessional e-Learning course ("Basics in Palliative Care"). Learning objectives were based on a systematic curricular development process. The course was designed to prepare medical students for a written exam in palliative care. Didactic methods used were interactive case study, virtual standardized patients (VSPs), e-Lecture sequences and interprofessional education [1]. Students received continuous online and telephone support. We assumed that this novel approach would lead to sufficient preparation for knowledge assessment and yield high acceptance within the cohort. Further, we evaluated post-intervention self-assessment of competence in dealing with dying patients and their families, knowledge in palliative care symptom control and perceived skills in communication [2].

Method: Questionnaire-based cross-sectional study of clinical (fourth- and fifth-year) medical students (N=628) at Medical Faculty of the Heinrich-Heine-University Dusseldorf, Germany, between summer semester 2013 to summer semester 2014. A twenty items multiple choice questionnaire, the German version of the Program in Palliative Care Education and Practice Evaluation (PCEP-Harvard Instrument), and a ten items self-developed acceptance questionnaire were used for evaluation. The data were collected after completion of the e-learning course.

Results: Student acceptance of this teaching method was high (mean 1.8 [1-6]; n=628; SD=0.8). Post-intervention assessment of self-efficacy in palliative care competence was high. The test results of the multiple choice exam showed a Gaussian distribution.

Discussion: The use of e-Learning in UPCE was widely accepted by medical students. Self-assessment of competence in palliative care increased but more practice-based training was requested by the students. An important task for further didactic research in UPCE is to explore the longitudinal effects and limitations of e-Learning-based approaches.

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Fostering competencies in medical education with video-based worked-out examples

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An important competence of medical doctors is the communication with patients, especially in breaking bad news (BBN) situations. Worked-out examples have been successfully applied to support acquisition of skills. Video-based worked-out examples have been found beneficial especially when no predetermined solution is available. Theoretical approaches on learning through observation predict that observing models similar to the observer and of high subjective status have positive effects on skill acquisition. Recent research provide, in addition, evidence that erroneous worked-out examples can have positive effects on skill acquisition as well. We conducted a series of three studies to evaluate the implementation of video-based worked examples to facilitate communication skills in the context of BBN situations. The three studies examined whether

1. the implementation of video-based worked examples has positive effects on skill acquisition (N=105),
2. erroneous worked-out examples have positive effects on skill acquisition (N=61), and
3. whether status of the model has a positive effect on skill acquisition (N=71).

In each study, medical students learned the complex skill of delivering a cancer diagnosis using a web-based learning environment (except control condition in study 1). The communication skill was measured using a simulation-based test with standardized patients. Results show that (1) the implementation of video-based worked examples had a positive effect on skill acquisition. The (2) erroneous model had a negative effect on skill acquisition compared to an error-free model. Finally, the comparison between a model with the same status (student) and a model with higher status (professor) showed significantly higher skills in the condition with a model with the same status. Our studies provide evidence that video-based worked examples can contribute to the acquisition of competencies in medical education. Furthermore, the findings emphasise the role of the careful design of learning material.

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Poster Presentations

Learning & Skills

30

Optimization of clinical bedside teaching through structured improvement measures

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Introduction: Clinical Bedside Teaching plays a crucial role in the education of young physicians. Commonly, these courses are a major opportunity for medical students to learn and improve clinical skills as history taking and physical examination. Due to the fact that students tend to spend fewer time at patient's bedside, it is of even greater importance to exploit the time effectively. The aim of this study was to evaluate whether structured improvement measures in Bedside Teaching would enhance the student's performance with respect to clinical skills.

Methods: During a Bedside Teaching Course for Internal Medicine at the Technical University of Munich students as well as teaching physicians had the chance to evaluate the performance of the students' clinical skills. Grades according to the German grading system (1-6; 1: best; 2: worst) were given in an online questionaire in the categories „history taking & physical examination", „diagnosis", „therapy". After two of the four semesters of the study, improvement measures such as E-Learning cases, a script as well as a structured briefing for lecturers were implemented in the course.

Results: Within every semester the self-evaluation of the students improved significantly when comparing the first (6 appointments) and second half (6 appointments) of the courses. This effect could partly be confirmed by the lecturer's evaluation. Significant improvements in the self-evaluation of the students could be seen in two of three categories („history taking & physical examination": p=0,000, „diagnosis": p=0,000, „therapy": p=0,010). From the physician teachers' perspective the improvement of the first two semesters compared to the last two semesters were significant in the categories „diagnosis" (p=0,028) and „therapy" (p=0,000).

Discussion: Improvement measures such as E-Learning cases, a script and a briefing for physician teachers had significant effects on learning clinical skills. The student's self-evaluation improved significantly, whereas these improvements in clinical skills can only partly be observed by the lecturers.

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What is the effect of experiential learning in undergraduate palliative care education?

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Introduction: Undergraduate Palliative Care Education (UPCE) has become a mandatory topic during medical training in Germany. Evidence for UPCE didactic interventions hints towards a clear preference by medical students for experiential learning with real patient contact and emphasise on effective role modelling. We modelled a blended-learning-seminar "Communication with the dying patient" which consists of

1. 8 units of e-learning introduction,
2. longitudinal 1:1 encounters with palliative care patients,
3. a debriefing reflection seminar combined with
4. a written personal experience essay.

The aim of this intervention is to facilitate more knowledge, increased feeling of preparedness in dealing and communicating with dying patients (self-efficacy) and increased sense of meaning in life.

Methods: This quasi-experimental study with a pre-post test design includes four electronic questionnaires (self-estimation of preparedness and basic skills in palliative care, opinions and attitudes towards death, meaning-in-life inventory, five factor personality inventory) along with demographic variables. Two intervention groups (summer semester 2014: n=18, winter semester 2014/2015: n=16) were invited via e-mail to answer the questionnaires. N=34 matched medical students served as controls.

Results: As of this writing, 34 students in the intervention group answered the questionnaires before the seminar (pre-test) and 9 students answered the questionnaires after the seminar (post-test). There are 77% women and 22,73% men between 20 and 32 years. Detailed analysis of the comparison data (intervention group vs. control group) will be presented.

Discussion: Medical students call for more direct patient contact during their medical training. Using a blended-learning approach, we piloted a real-patient contact intervention which balanced user preference with ethical and resource-oriented concerns. Longitudinal qualitative research is needed to explore the impact on knowledge, skills and attitudes of this intervention [1], [2], [3].

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Exploring the synergy of technical and non-technical skills in emergency medicine

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Introduction: Each of us may experience an emergency situation in everyday life. Therefore, cardiopulmonary resuscitation (CPR) is a topic that concerns everyone from medical expert to layperson. In contrary to laypersons, medical students receive specific training in CPR during their medical education.

Existing CPR trainings mainly focus on the so-called technical skills (e.g., ventilation or chest compression). There is no doubt that these skills are crucial to safe life. However, recent research shows that also non-technical skills (NTS), especially task management, team working and situation awareness, play a significant positive role during CPR [1], [2]. Insufficient NTS are the major avoidable weak spot in emergency medicine. Hence increasing NTS performance might help to prevent errors and therefore increase patient safety significantly [3], [4], [5].

At the conference, we would like to present and discuss a research initiative. Our research plan consists of three empirical studies. The overall aim is to investigate the synergy of technical and non-technical skills relevant for CPR performance in order to improve the current training in medical education. In the following, we briefly present the specific aim and approach of each study.

Research initiative: In the first study, we aim to examine expertise-related differences in CPR performance. In a quasi-experimental 5*2 design, the CPR performance regarding technical and non-technical skills will be compared.

In the second study, we aim to investigate how medical students acquire the relevant skills for CPR. A quasi-experimental 2*2*2 repeated measure design is used to compare different contemplation processes during skill acquisition.

In the third study, we aim to investigate the synergy of NTS and technical skills. In a quasi-experimental 2*2*2 design, the coherence between the two types of skills, especially the influence of NTS on technical performance, will be investigated.

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Improving medical students non-technical skills relevant for advanced life support

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Introduction: In emergency medicine, particularly in case of advanced life support, research has shown that non-technical skills (NTS) play a significant positive role [1]. Several studies show that these skills help to prevent errors and hence increase patient safety significantly. However, prior research also indicates that medical students fail to master NTS during cardiopulmonary resuscitation (CPR). Based on the theory of negative knowledge [2] a NTS training was developed. The aim was to investigate students' NTS and evaluate the training.

Methods: Altogether, 140 medical students in third clinical semester participated. An open and non-participant observation procedure was used to measure the following NTS: leadership, communication, teamwork and resource management. An observation form was developed based on the Anaesthetists' Non-Technical Skills (ANTS) system [3]. Participants were divided into two groups. Both visited a standard CPR course. Only one course got a NTS training implemented. After the courses, students did a simulated CPR and their performance was videotaped. Each video was rated by two researchers using the observation form for NTS. Descriptive statistics and correlations were used to analyse the data quantitatively.

Results: Results show that medical students consider NTS in CPR context as relevant. Significant correlations between several NTS categories were revealed. The group without NTS training failed to master NTS during CPR. The trained group showed adequate to good performance concerning leadership, communication and teamwork.

Discussion: Medical students consider NTS in CPR context as relevant, but nevertheless fail to master NTS without training. Our study shows that NTS can be improved by explicit training. Further research will be necessary to investigate whether and how NTS training can lead to enhanced patient safety and contribute to error prevention. Moreover, the synergy of NTS and technical skills has to be investigated in future research.

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The role of clinical knowledge in clinical reasoning activities: knowledge is not enough to solve the problems

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Introduction: Clinical reasoning is a key competence in medicine. There is a lack of knowledge, how non-experts like medical students solve clinical problems. We have previously shown that they have difficulties applying conceptual knowledge to clinical cases [3], that they lack metacognitive awareness [2] and that higher level cognitive actions correlate with diagnostic accuracy [1]. The role of conceptual, strategic, conditional, and metacognitive knowledge for clinical reasoning is unknown.

Methods: Medical students (n=21) were exposed to three different clinical cases and instructed to use the think-aloud method. The recorded 63 sessions were transcribed and coded with regards to the four different types of knowledge (see above). The transcripts were coded using the frequencies and time-coding of the types of knowledge. The relationship between the coded data and accuracy of diagnosis was investigated with inferential statistical methods.

Results: The use of metacognitive knowledge is strongly correlated with application of conceptual and conditional knowledge, but only weakly with strategic knowledge. Furthermore, metacognitive knowledge application leads to longer time on task. However, in contrast to cognitive action levels the use of different dimensions of clinical knowledge was not associated with better diagnostic accuracy.

Discussion: The longer case work and the more intense application of conditional knowledge in individuals with high metacognitive activity may hint towards reduced premature closure as one of the major cognitive causes of errors in medicine. Additionally, for correct case solution the cognitive actions seem to be more important than the clinical knowledge dimensions.

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Developing an Entrustable Professional Activity (EPA) "Conducting a ward round" in the surgical and psychiatric-psychosomatic branch. Domain specific versus general aspects

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Introduction: Ward rounds provide the basis for excellent medical care and are a central element in doctors' daily routines irrespective of the medical branch. In terms of competency-based medical education, entrustable professional activities (EPAs) have been defined for various medical tasks [1], [2]. Recently, we have analyzed medical competencies and defined an EPA for running a ward round in internal medicine [3]. So far, there is no satisfactory research on the competencies and activities necessary for running a surgical or psychiatric-psychosomatic ward round. This study aims at determining these competencies and integrating them in the respective EPAs. Furthermore, it is aimed to identify domain specific and domain general competencies.

Methods We performed an interview study with surgical and psychiatric-psychosomatic ward staff N=60 of a university hospital and several general hospitals. The ward staff consisted of experts such as surgical, psychiatric and psychosomatic senior physicians, resident physicians, nursing staff and - for psychiatric-psychosomatic wards - psychologists. A semi-structured questionnaire, based on a previous study, was used [3]. The competencies and activities necessary for conducting ward rounds were identified, compared and integrated in EPAs by qualitative content analysis [4], [5].

Results: The analysis shows that skills for communication with the patient and the team, as well as collaborative clinical reasoning are generic competencies in both specialties. Practical skills such as organization are more important for the surgical ward round, while soft skills like teamwork and empathy feature more prominently in psychiatric ward rounds.

Discussion: On the basis of the cross-domain competencies it will be possible to develop a general EPA "Running a ward round" and to implement it in student education. Concerning the domain-specific competencies further research is needed to determine whether they should rather be taught at university or in medical specialist training.

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Adapted peer-assisted PEYTON-Method and gradual assessment for sustainability of student's skill to exercise indirect mirror technique of the Ear-Nose-Throat (ENT) area

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Introduction: Trainees have to reach a certain level of skills competence before they are supposed to use these skills on patients. One way of teaching skills, the Peyton's Four Step Approach was designed for a 1:1 teacher:student ratio, requiring enormous resources of teachers. The aim of the present study was to develop and evaluate a modified Peyton's approach for teaching groups of up to 30 students by one teacher. The research question is: is it possible that a single teacher can transfer skills to a group of up to 30 students, making them fit for performing these skills competently on patients. Only significant modifications of Peyton's four steps together with curricular adaptations can fulfil this requirement.

Methods: In the academic year of 2013/14 at the Medical University of Vienna students of the 5th year have to pass the ENT clinical module within 2½ weeks. The central learning goal is to achieve the competence of the indirect mirror technique and apply it to patients. 275 Students in 12 Groups of 25 to 30 participants were included in the study. Modification of Peyton's four steps was:

1. only one teacher,
2. intensive use of peer-assisted teaching
3. intensive theoretical knowledge before
4. ongoing assessment
5. emphasis on communication with patients.

Results: An initial questionnaire with 18 questions concerning clinical ENT-anatomy showed 16.9 correct answers on average. The peer-assisted learning contributed substantially to the learning process. All students could be transferred to patients contact without hesitation – after repetition and final assessment in a small group of 6 to 7 students.

Discussion: This modified Peyton's approach to instruct larger groups of students in the indirect mirror technique in the ENT-field has shown to be practicable, well accepted by the students, however is carried out with an enormous demand on the single teacher. Skills require more than performing key tasks. Further research should address the realization of the model to other clinical subjects and skills [1], [2], [3], [4], [5].

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The relationship between medical competencies and overall preparedness among graduates

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Introduction: Medical curricula have been fully reformed in recent years. In this regard, research focused more strongly on general learning goals. The CanMEDS framework describes roles a medical professional may develop. These include, besides the role of a medical expert, for instance the role of a communicator [1]. Based on this idea, the Freiburg Questionnaire to Assess Competencies in Medicine (FKM, [2]) was designed. Consequently, the question emerged how competent and prepared graduates assess themselves after 6 years of medical studies.

Methods: A new survey was implemented in Aachen, Germany, developed from a theoretical model [3], [4]. At the end of their studies, 82 young doctors completed a questionnaire containing the FKM inventory. Graduates evaluated their medical competencies as well as their overall preparedness on a five-point Likert-scale (1="not at all competent/prepared" and 5="very much competent/prepared").

Results: Overall graduates felt quite well prepared (M=3.7, SD=0.6). They claimed to be most competent in learning (M=4.1, SD=0.5) and communication (M=4.0, SD=0.7). Furthermore, we found high correlations between overall preparedness and more specific competencies such as medical expertise (r=.56, p<.001), team competence (r=.41, p<.001), and learning competence (r=.48, p<.001). Most interestingly, exam results were neither related to medical competencies nor to overall preparedness (all r<.30).

Discussion: This study revealed that the more young doctors assessed themselves as being medical experts, team competent, and learning competent, the more they felt prepared in general after six years of studying. To what extent specific elements of the curriculum and/or educational objectives had an impact on graduates' subjective competencies should be analysed in further investigations. In order to investigate the transition from a student to a professional doctor, the survey could be expanded into a longitudinal study and combined with university surveys 1.5 years after the exam.

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Student Health

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Similarities and differences in mental health of students in medical degree programs at Erlangen

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Introduction: With a significantly higher prevalence than the average population, medical students are at risk for burnout and to develop psychiatric disorders like depressions and anxiety disorders.

In Erlangen there are three medical degree programs with students of human medicine, dentistry and molecular medicine. We investigated those three groups comparatively with standardized psychological tests for burnout, depression and sense of coherence, assuming that these subgroups can be differentiated concerning the status of their mental health.

Material and methods: 758 students of human medicine, dentistry and molecular medicine were investigated in winter semester 2012/13 with standardized psychological questionnaires: BOSS-II (physical, mental and emotional burnout) and BDI-II (depression). All in all about 90% of the medical students´ population of the pre-clinical semesters (1-4) were investigated in that semester.

Results: All groups showed results of a higher mental stress the longer they had studied in their respective degree program. The students of dentistry and molecular medicine had massively higher values for depression and burnout compared with students of human medicine.

Discussion: With several subpopulations of medical students there might be different levels of stress for the students and/or at least different profiles of these medical students. In all the three subgroups we found higher values for depression and burnout correlated with a higher semester, thus indicating the necessity to counteract this potential development of mental stress and psychiatric disorders in each degree program. Due to the different populations and the higher mental stress measured in dentistry and molecular medicine, further investigations on the reasons for these differences must be conducted. Still, an adapted way of coping with this development for each degree program should be considered.

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Technology-enhanced Learning

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Development of a web application for competence-oriented eLearning-tools

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Introduction: Currently the National competence-based Catalog of Learning targets (NKLM) is being developed. After its introduction it will represent a common reference point for the core curriculum of the medical education in Germany.

Based on the Canadian "CanMEDS" role model that represents the profession of a physician/doctor through different roles, roles are defined in as well in the NKLM consisting of competencies and learning objectives to medical knowledge, practical skills, professional attitude and medical action.

Modern eLearning instruments and tools are increasingly used in medical education and are often already integrated as an inherent part in the teaching.

How can competence-based eLearning tools be identified, visualized and documented as well as being collected in the form of "best practice"? The results should be published and made available for others.

Methods: In the competence network “medical education in Baden-Wuerttemberg” the eLearning instruments, which are preferentially used at the 5 related medical faculties, were reviewed according to the goals and objectives of the NKLM catalogue. On the basis of this review , a database-driven web application has been developed, which is used for managing the results and linking the collected Data to the appropriate roles and responsibilities in NKLM for further use.

Results/Discussion: The single eLearning courses can be individually filtered and sorted to obtain a detailed overview and find "best practice" examples to certain NKLM skills.

This possibility of specific needs analysis of eLearning services of the medical faculties was created to allow a quick overview. Faculties, lecturers, students as well as people, who are interested in eLearning all benefit from this transparency and collection of “best-practice” examples. Possible redundancies and gaps can be identified and related eLearning contents will at the best be developed in common.

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Acquiring skills and competencies for life-long learning: integrating video-documentation in health care curricula

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Introduction: The need for specific competencies to prepare students for life-long learning (LLL) to be flexible in the future health care environment have been recognized and subsequently integrated in professional and interprofessional competency frameworks [1], [2], [3]. Not only motivational aspects relating to the relevance of LLL need to be part of the curriculum. Students need to be equipped with skills that can easily be applied in the process of self-reflection. New electronic media, such as video and/or audio documentation, can support this process.

Method: A seminar for audio and video documentation was implemented within the bachelor degree Interprofessional Health Care (B.Sc) at Medical Faculty Heidelberg. Aim of the 20 hour seminar was to provide students with the set of skills to make high quality recordings, taking into account visual, technical as well as private data security aspects. In groups of 4-5 the students video-recorded a professional situation which they had agreed upon. Script, video shooting, sound and video editing were taught in theory and transformed into a video in the tutorial. The seminar was evaluated on a scale from 1 (very bad) to 6 (very good); the generated videos by the instructor. The students need the acquired skills to document a communication situation for upcoming exams.

Results: The seminar has been run twice with two cohorts (39 students: 32 female, 7 male; mean age 22.9 years). High quality videos were generated in various clinical contexts, some in interprofessional student groups. Videos were rated good to very good by the instructor; the seminar with 4.7 (N=21; SD 0.7). Students expressed later, that they could concentrate on content aspects for the exam video.

Discussion: The acquired skills can be linked with aspects relating to continuous professional development and LLL. Students need a set of tools they can apply in their future professional environment.

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Video analysis of trainees' surgical performance. A new strategy to identify training needs

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Introduction: Training needs of students in respect to stepwise acquisition of basic surgical skills are rarely explored. Training curricula are generated according to defined learning goals, established by authorities in the field. However, training curricula are not created to prevent typical psychomotoric errors encountered by most of the students.

We raised the hypothesis that identification of typical errors is the prerequisite for the development of error-preventing exercises.

Method: Students performed an interrupted suture with 3 stitches on a foam pad during a facultative OSCE. The procedure was video-taped and analysed according to pre-defined criteria of all procedural steps: handling of instruments and sutures, knotting, and cutting suture lines.

Analysis of the frequency and "mechanism" of the errors were used as basis to design exercises needed for preventing errors.

Results: All 30 students had some errors in their procedure, but of highly varying severity The detailed analysis of video-material revealed 4 main errors: Errors occurred in all steps of procedure:

1. Geometry of needle in needle holder and of needle holder in hand of trainee was inappropriate leading to non-physiological movement when placing stitch.
2. Handling of suture line was not adjusted to surgical field leading to extremely wide movements.
3. Knotting procedure was performed with inadequate length of suture ends leading to difficulties performing the knot.
4. Instruments were displaced for cutting suture line leading to additional steps to reposition the instruments.

Performing the newly developed instrument handling and knotting exercises prior to performing the whole complex procedure already proved to be helpful as tested in a small pilot study.

Discussion: This observational study represents a new approach in video-based teaching. Videos are not only used to enhance the performance of the students but to improve the training procedure by analysing errors in terms of their "mechanism" and frequency.

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Communication and Social Skills

42

Facilitating communication competency: an interprofessional seminar on medical error communication

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Introduction: International trends in medical education highlight the need for competency-based curricula in order to prepare students to contribute effectively in future healthcare teams. Competency frameworks [1], [2], [3], [4] are available to guide curriculum development and include core competencies such as communication and collaboration, which will also play an important role in the German national competence-based catalogue of learning objectives for medical education (NKLM). To date, little evidence is available on facilitating communication competence in an interprofessional education setting in Germany.

Method: An interprofessional seminar on medical error communication was offered in the winter semester 2014/2015, with interprofessional teaching teams facilitating the learning process. Structured exercises and mini role-plays reflecting 'real world' situations were conducted and students had an opportunity for feedback and reflection after each activity. At the end of the seminar, a patient safety observation assignment was set and a formal debriefing occurred six weeks later. Twenty-four students took part from five professions including medicine, nursing, physiotherapy, laboratory science, and orthoptics. The seminar was evaluated electronically via EvaSys using a Likert scale from 1 (most negative) to 5 (most positive).

Results; Evaluation showed a positive impact. For active learning related to communication of medical errors, 55.6% of respondents gave a score of 4 and a further 22.2% a score of 5 (mean value 4.11). Regarding the ability to self-reflect on attitudes to patient safety and communication of error, 55% of respondents gave a score of 4 and a further 12.5% a score of 5 (mean value 3.89). Finalised results will be reported at the conference.

Discussion: Communication and collaboration competence development for health care students is being actively promoted in the interprofessional seminar on medical error communication at Heidelberg Medical Faculty with integration in two curricula.

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How physicians at the Frankfurt University Hospital see their role as a teacher

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Introduction: Physicians at university hospitals have to fulfill different roles and are not only responsible for patient care. One of these roles of physicians described in the CanMEDS Framework is called the "Scholar" and one of its competencies is to "facilitate the learning of [...] students [...]" [2]. Furthermore a medical teacher is more than just an information provider but also covers roles like the assessor, the role model or the resource developer [1]. This study investigates how physicians at the Frankfurt University Hospital look at teaching and if the described theoretical framework is found in their self-perception.

Methods: To answer this question a qualitative design was chosen. The data collection was carried out by semi-structured interviews. The interview guide contained 16 questions and the interviews took between 13 and 37 minutes.

The sample consists of 40 physicians employed at the Frankfurt University Hospital. The interviewees were assistant doctors, senior physicians and heads of department as well. Differences between operational and conservative professions are assumed so the sample was divided between these two groups.

For data analysis the thematic qualitative content analysis [3] was chosen and to support this process and to ensure an audit trail the software MAXQDA was used.

Results: All interviews are conducted and are currently analyzed. The results will be presented.

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What is the published evidence on values and attitudes of undergraduate medical students towards palliative care education?

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Introduction: Undergraduate Palliative Care Education (UPCE) has become a mandatory topic during medical training in Germany. Challenges, such as large numbers of students relating to small numbers of experienced teachers and appropriate patients need to be considered during curricular development. Our goal was to explore the existing evidence from the user perspective on what constitutes successful and meaningful learning within the context of UPCE.

Methods: Systematic literature review (PRISMA-statement [1]) and qualitative synthesis. We searched PubMed and Google Scholar in 02/2014. The major search filter domains were "palliative care", "values", "education" and "medical student". All study types published between 01/2000 to 01/2014 were included. Additionally, hand searching of German journals (z.B. Zeitschrift für Palliativmedizin) was conducted. Qualitative analysis was based on Thomas´ recommendations concerning thematic synthesis of qualitative research [2] and a structured multi-step qualitative content analysis after Mayring.

Results: A total of n=80 publications were included (n=54 quantitative; n=26 qualitative design). The majority of interventional studies evaluate palliative care training interventions. All observational studies focus on students´ attitudes and experiences during UPCE. In general, students seem to have a positive and interested attitude towards palliative care. Evidence for UPCE didactic interventions hints towards a clear preference for experiential learning with real patient contact and emphasise on effective role modelling. There seems to be an overall feeling of unpreparedness in medical students for dealing with medical decision-making at the end of life and in discussing end of life decisions including requests for euthanasia.

Discussion: The findings from this review could inform and support effective curricular development in UPCE in Germany. Publication and geographical biases need to be considered as the majority of publications originate from anglo-american authors. For future intervention modelling in UPCE, more data from Germany is needed.

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Decision making in oncology – how does uncertainty affect physicians during this process? – A simulated explorative study

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Background: Especially in the process of decision making in oncology, physicians are confronted with high levels of uncertainty. Studies have shown that perceived psychophysiological stress has an impact on emotions and decision making [1].This study is designed to investigate in how uncertainty affects physicians in the process of decision making and how uncertainty is discussed in patient-physician-communication.

Summary of work: 30 physicians will be recruited for the task of a simulated process of decision making over 21 days. It includes 5 assessment points:

1. reading the patients' file,
2. watching a short video of the first physician-patient encounter,
3. receiving a multidisciplinary recommendation for treatment,
4. deciding on a treatment option in a standardized role-play and
5. short interview on the reaction to uncertainty in the role-play.

At all assessment points physicians are asked to fill out questionnaires on tolerance of uncertainty, decisional comfort, perceived distress and decisional satisfaction before and after each task.

Summary of results: By the time of the conference we will present the study protocol and first results.

Discussion: This study is linked to the study of the Université Libre de Bruxelles (ULB). A comparison between German and French-speaking physicians promises a better understanding of different approaches to uncertainty and can improve physician-patient-communication in both countries.

Conclusion: This study provides information about physicians' reactions to uncertainty.

Take-Home-Messages: Uncertainty is an important element in oncology and affects physicians in the process of decision making.

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Competency-based medical education: Certainty in evidence-based decision-making in own and other domain

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On PubMed alone, about one new reference is listed every minute [http://duncan.hull.name/2010/07/15/fifty-million/] – and there is a need for physicians to be able to handle this growing amount of new evidence in order to arrive at the most up-to-date, evidence-based decisions for each patient. To be able to train this competency, the ability to identify influencing variables of informed decisions is essential and one controversial confounder in decision-making research has been the certainty of personal judgment which is essential to avoid incorrect diagnoses and therapies [1]. We wanted to know how personal certainty in decision-making changes after students are confronted with ambiguous evidences.

Furthermore, we wanted to identify whether performance in evaluating scientific papers is a domain-specific competency.

Between Nov 6th and Dec 6th 2013, 165 medical students from LMU Munich edited a scenario from both the medical and educational domain, and made decisions before and after reading scientific papers on the subject. They rated the pertinence of these papers to their decision, which was correlated with an expert rating, as well as their personal certainty before and after reading the papers (self-assessment).

The medical students' judgment of the papers' pertinence was better for those in the educational than medical field ($F(1,164)=31.98$; $\eta 2=.16$), whereas personal certainty significantly increased only after reading in the medical domain ($F(1,163)=11.51$; $\eta 2=.07$).

The medical students were more easily able to judge the pertinence of the educational papers than the medical papers, which rather argues against a domain-specific ability to perform evidence-based decision-making. As self-assessed certainty increased with reading and evaluating scientific evidence, monitoring personal certainty seems to also be important for successful integration of teaching sessions on evidence-based decision-making [2].

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Breaking bad news – how do physicians cope with this challenge? A qualitative study to assess coping strategies of oncologists and medical students using Stimulated Recall

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Introduction: Breaking bad news is a challenging task for physicians. Communication skills training (CST) improves effectively doctor's performance in this part of medical work. Physician's coping on breaking bad news still remains mostly disregarded. This qualitative study investigates physician's and medical student's coping strategies while breaking bad news to their patients.

Methods: Six physicians and six medical students took part in this qualitative study. The method of Stimulated Recall was used to investigate the subject's emotions and thoughts while breaking bad news: therefore, conversations of physicians with their cancer patients were videotaped. The same procedure was done with consultations of medical students with standardized patients (SP). Sequences of breaking bad news were filtered by the researchers. According to the method of Stimulated Recall, those sequences of the subject's own conducted conversations were shown to themselves. The subjects were interviewed assessing their emotions, thoughts and coping strategies observing their own interaction on video.

Results: By the time of conference we will present results of qualitative investigations.

Discussion: The method of Stimulated Recall will provide a deeper insight in physician's coping of this challenging task. It also will provide information how to prepare medical students better for this duty . The findings will help to improve didactic concepts of communication between physicians and patients [1], [2], [3].

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Assessment & Feedback

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Reliability and predictive validity of an OSPE in operative dentistry

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This retrospective longitudinal study evaluated the reliability and predictive validity of an objective structured practical examination (OSPE), which is used to assess the transition from first (6th) to last (11th) semester during clinical education in operative dentistry.

In order for students to advance to the 6th semester, the preliminary dental examination (PDE) must be completed. At Goethe University Frankfurt the evaluated OSPE is administered at the end of the first clinical semester to assess student preparedness for later patient care activity. In the 11th semester the dental state examination (DSE) includes practical patient-centered competencies of candidates in operative dentistry. The complete clinical study period for the dental curriculum comprises optimally of 6 semesters.

The study population consisted of 471 students. The total reliability of the OSPE was assessed by Cronbach's alpha. Using Pearson correlation and multiple regression, the predictive validity of the examination was also evaluated by correlating student scores on the OSPE with their clinical performance as measured by successful completion of patient-centered procedures during the DSE. Further, the impact of the PDE, the factual complete clinical study period (P), the preparation time with fellow students (T), and the declared level of stress (S) before OSPE was evaluated.

Findings indicate a highly reliable OSPE (α=.86). Good performance in the OSPE was associated with good performance later in the DSE (r=.138, p=.03). Long study periods are accompanied by poor exam performance (r=.215, p=0.001). Correlations ranging from r=.414 (T) to .221 (S) and .214 (PDE) were also stated.

The findings suggest that the evaluated OSPE can serve as a reliable and predictive assessment during the transition from first to last clinical semester in a dental curriculum. Preparation time with fellows before OSPE should be enforced in future.

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Under which circumstances is workplace-based assessment effective? Development of a model using a mixed method approach

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Introduction: To provide support and to structure learning of junior doctors workplace-based assessments (WPBA) have widely been introduced. WPBA is a tool to give formal feedback in an every-day working situation and thereby enhance workplace-based learning [2], [3]. So far, it is still not well understood which factors support and which hinder effective WPBA [1].

In my PhD-project I will address the following research questions:

1. Which are facilitating and hindering factors for effective WPBA and reasons for that on the context level (e.g. dedicated time for WPBA encounters), the assessors' level (e.g. willingness and ability to give 'painful' feedback in a constructive way) and the candidates' level (e.g. actively seeking clarification of unspecific feedback) as perceived by medical students, residents and assessors?
2. Can these factors and their contextual relationships be supported by quantitative studies?

Methods: Based on a qualitative approach using grounded theory and a comprehensive literature research factors will be generated which determine effective WPBA as perceived by medical students, residents and assessors from different clinics. Within this qualitative approach a model of effective WPBA will be developed which finally shall be validated using quantitative methods and multi-level analyses.

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Impact of structured, written peer feedback on content, structure and quality of lectures in surgery

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Introduction: Though often criticized, lectures are still one of the most important parts of medical education as they represent an economical and efficient method for teaching. In times of growing numbers of students, they get even more important. At our medical school, students report on deviant quality of the lectures in surgery according to different lecturers. Till now there was no evaluation of the lectures in surgery at our medical faculty. The aim of this study is to analyse the impact of structured, written peer feedback on content, structure and quality of lectures in surgery.

Methods: In this study, 31 lectures were analysed by minimum 2 trained reviewers (minimum one peer reviewer and one medical student) using a 22-item assessment tool. Every lecturer received a written feedback prior the beginning of the next years' lectures series, comprising the topics 'content and organisation', 'visualisation' and 'presentation'. For each item, they received their own rating, as well as the median, best and worst rating on each item, so that each lecturer could compare his lecture with the other lecturer. In addition, they received a global feedback and the offer for an individual counsel. Next lectures were assessed in the same way.

Results: 31 lectures were reviewed in the first lecture series. Overall a rating of 3.7 on a 5-point Likert Scale (from 5 = excellent demonstration of performance to 1 = does not demonstrate) was achieved. The best results were achieved in 'content and organisation'. After the presentation of written feedback, a significant improvement in the lecturers' scores in all categories could be demonstrated.

Discussion: A written structured peer feedback has a major impact on lecture quality structure and content.

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Curriculum Development

51

Overcoming barriers to anchor interprofessional education in health curricula

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Introduction: Logistical and attitudinal barriers can hinder integration of interprofessional education (IPE) into curricula. The WHO's Framework for Action on International Education & Collaborative Practice highlights the need to prepare students as a "collaborative practice-ready health workforce" [1] essential for maintaining quality health care and patient safety.

Method: A five-member development team (from medicine, nursing, psychotherapy, sociology) designed and piloted an interprofessional seminar introducing students to three competency fields: team work, communication and decision-making. Forty students took part from medicine, nursing, radiography, laboratory science, and orthoptics. Teaching teams were interprofessional (medical and nursing). The seminar was delivered four times over two weeks, with each seminar having ten participants. Content and format remained the same. Attendance was compulsory.

Results: Attitudinal barriers at institutional level were overcome once agreement was reached to start small with a pilot project, an acceptable middle way for both enthusiasts and initial resisters. Concerns about the didactic challenge of IPE for staff accustomed to teaching monoprofessionally were responded to pragmatically. The logistical challenge of bringing teaching staff together meant that only one face-to-face session occurred. Additional information was provided in electronic form. For this reason, highly experienced teachers were selected for the pilot. A further logistical challenge was timetabling the seminar across already densely packed curricula. One 3½ hour timeslot in a scheduled communication module of the undergraduate medical curriculum was identified as an adaptable target and timetabling took place around this.

Discussion: Complexities related to attitudinal and logistical barriers as well as existing curricula and resource constraints had to be managed with a pragmatic approach, but following the success of the pilot IPE initiative, four additional interprofessional seminars have been anchored in the undergraduate health curricula at Heidelberg Medical Faculty. Interprofessional planning and teaching teams were the key enabling factor.

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Interdisciplinary curriculum mapping based on the National Competency-Based Dental Learning Objectives Catalogue (NCDL)

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Curriculum mapping forms the basis of effective competency-based teaching, learning and assessment. The NCDL in Germany was developed on the basis of the CanMEDS framework. It contains 28 working packages (WP) in total. This study sought to evaluate the Frankfurt curriculum in dentistry and to generate recommendations for updating it with regard to the NCDL.

An interdisciplinary (cranio-maxillofacial surgery; oral surgery; operative dentistry; orthodontics; periodontology; prosthodontics) team of experienced teaching faculty members and students evaluated the current curriculum. All team members reviewed the complete catalogue of 1,409 educational objectives, in terms of whether they are represented in their own fields (e.g., for teachers) or courses (e.g., for students) and regardless of whether they are important to the dental profession in general.

The results reveal that the Frankfurt Dental Education covers 1,034 of all NCDL learning objectives from the teachers' perspective. Learners succeeded in 875 learning objectives that were in accordance with NCDL. The individual contents were identifiable in some WPs in complete (for example, WP 16 d and h, WP 23), in nearly complete (for example, WP 16g, WP 19, WP 21) and in low (for example, WP 10, WP 16i, WP 22) data. The mapping resulted in recommendations to several dental and medical departments to integrate specific learning objectives into the curriculum. Furthermore, 11 recommendations for interdisciplinary courses (e.g., extraction versus tooth preservation) were given. All disciplines received an individualized competency-based catalogue of learning objectives.

Curriculum mapping of the Frankfurt Dental Education with the NCDL served as an ideal communication tool for faculty members, and it promotes the development of the local curriculum and, thus, of the NCDL as well.

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Implementation of a competence based curriculum on vaccination at the medical faculty of LMU, Munich

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Introduction: Currently the way of teaching in medical education is changing. It develops more and more from teaching just factual knowledge to teaching competence levels and practical techniques [1], [2]. Facing the problem of vaccine fatigue [3] we decided to develop and implement a competency- based curriculum on vaccination. This implementation is a process that requires but also establishes a new kind of behavior and thinking about the way of teaching and interdisciplinary interaction. To improve this interdisciplinary interaction we designed a longitudinal curriculum on vaccination.

Methods: The Medical Faculty of LMU identified five competence based learning objectives that weren't part of the curriculum up to now. A consensus conference with faculty, students and external academic teachers developed a consensus plan to implement these new learning objectives into the medical curriculum.

Results: All new five competence based learning objectives could be implemented into the curriculum of the medical faculty of LMU Munich. Altogether the competency-based curriculum on vaccination includes 35 learning objectives that are represented longitudinally in the medical curriculum.

Discussion: Using the example of vaccination we found a method of developing and implementing new competency-based longitudinal curriculum with concerted learning objectives. This method can be assigned to other curricular topics at LMU and at other medical universities. An open question is whether teachers actually adopt the new learning objectives and whether the change is sustainable.

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Workshops

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Moving educational scholarship forward: A journey from outputs to outcomes and impact?

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1. **Purpose of the workshop:** The professionalization of medical education needs a common understanding and applicable operationalization of educational scholarship. The purpose of this workshop is to foster a common understanding of educational scholarship by introducing and illustrating outcome models and how they can improve impact and value of scholarly activities in education.
2. **Targeted audience:** All active and experienced educational scholars interested in faculty and career development in academic medicine.
3. **Intended outcomes:** The aim of the workshop is to discuss and propose a framework for future appreciation of educational scholarship. Ideally, the workshop can serve as a basis for a publication on a future model of outcome- and impact oriented educational scholarship in academic medicine [1].

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Performance assessment and debriefing tools in simulation-based medical education research: Experiencing usability and discussing value and transferability

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1. **Purpose of the workshop:** Valid measurement of participants' performance in a simulated medical environment is a key requirement in simulation-based medical education research [1], and adequate debriefing of simulation scenarios is of fundamental importance for participants' learning. Tools for the assessment of performance as well as for the debriefing have been developed during the past years [2], [3]. In this workshop, participants will utilize and experience different rating tools for performance and debriefing in practice and analyse aspects of their suitability. Finally the transferability into real clinical environment will be discussed.
2. **Targeted audience:** Educational scholars interested in simulation-based medical education research regardless being well or less experienced.
3. **Intended outcomes:** The aim of the workshop is to familiarize participants with measurement tools for performance and debriefing used in simulation-based medical education. Ideally, the workshop can support the adequate design of studies in this field.

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Teaching clinical reasoning: current approaches and a research agenda

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1. **Purpose of the workshop:** The workshop aims at (1) discussing current approaches for teaching clinical reasoning to medical students and residents, and (2) analyzing these approaches in light of empirical findings of research on the theme.
2. **Targeted audience:** Clinical teachers and researchers interested in the investigation of educational approaches for teaching clinical reasoning.
3. **Intended outcomes:** The workshop is expected to generate (1) a synthesis of approaches that have currently been used to teach clinical reasoning; (2) a critical analysis of these approaches in light of available evidence on the theme; (3) an outline of an agenda for future research on how to teach clinical reasoning.

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Professionalism: How to develop surveys for peers and patients

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There is a growing awareness of the importance of professionalism and great interest in methods for assessing it, even though they are in their infancy. The goal of this workshop is to familiarize participants with the range of methods currently available. In addition, it will focus on one of those methods, patient and peer questionnaires, and address the issues of deciding on content for the questionnaire, determining the scale and scoring procedures, specifying ways of developing reliable scores, and esti-

mating the bias introduced by settings and patients. Active involvement will be encouraged throughout and small group exercises will focus on defining behaviors associated with professionalism and developing items to capture those behaviors.

Learning Objectives:

After attending this workshop, the learner will:

1. Be familiar with the range of methods for assessing professionalism
2. Understand the limitations of current methods for assessing professionalism
3. Be able to identify the steps in creating a patient or peer survey
4. Understand some strategies for ensuring the reliability and validity of peer and patient surveys

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Improving research competence and capacity in medical education

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In this workshop participants will work in groups to discuss challenges and opportunities, visions and strategies for moving forward the field of medical education research with a focus on research competence and capacity. The intention is to delineate some future activities to be discussed in a wider forum.

1. **Purpose of the workshop:** To identify challenges and strategies to move forward the field of research in medical education.
2. **Targeted audience:** Students and faculty engaged in medical education research.
3. **Intended outcomes:** Identification of key challenges in field of medical education research, Suggestion of future activities to move forward the field.

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Using Direct Observation for Teaching and Assessment

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Direct observation allows clinical teachers to gather accurate information about the actual performance of medical students in real-life settings. Without direct observation, one can only make inferences about how a medical student is performing. Although standardized tests allow assessment of “Know” and even “Know How”, only direct observation can allow instructors to evaluate learners in the areas of “Shows How” and “Does”. The workplace-based assessment within the clinical environment remains as the assessment method with the greatest capacity to capture trainees’ higher levels of performance.

Direct observational assessment depends on availability and motivation of faculty as well as the selection of the proper tools and associated rater training. Faculty may rarely observe or assess learners performing histories and physical exams. And even when they do, they are not immune to social pressures that lead to poor validity. Direct observation allows for the more accurate assessment of the more nebulous clinical competencies. The next challenge is how and where to record these observations.

A sample of common tools that have provided validity evidence include mini-clinical examination (miniCEX), objective structured assessment of technical skills (OSATS), standardized patient encounters, videotape of clinical encounters, chart stimulated recall, and 360 degree evaluation.

Learning Objectives:

By the end of the workshop, each participant should be able to:

1. Define direct observation (DO)
2. Identify existing challenges to direct observation
3. Identify approaches to solving challenges to DO
4. Name one potential solution to solve a challenge to DO
5. Critically analyze a proposed solution to specific challenge in DO
6. Practice using a specific tool to engage in DO
7. Apply skills learned to improve faculty development at home institution

The workshop will be very interactive and a number of video clips will be utilized with enough opportunity for hands on experience.

Please cite as: Tekian A. Using Direct Observation for Teaching and Assessment . In: 4th Research in Medical Education (RIME) Symposium 2015. München, 19.-21.03.2015. Düsseldorf: German Medical Science GMS Publishing House; 2015. DocW6.
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Poster Presentations – PhD/MME Research Day

Poster Session 1

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Scaffolding the development of medical students' ward round scripts using engagement and sequence reflection prompts in a computer-supported learning environment

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Background: Despite their importance, ward rounds are disregarded by medical curricula and students report difficulties in understanding them. Our previous study [1] revealed that students perceived rounds - and especially their own role - as characterized by passive activities that contribute little to knowledge construction and put a focus on activities not relevant for rounds. Results indicated a need for facilitating students' ward round scripts in terms of

1. understanding ward rounds as encounter for knowledge construction [2] and
2. the typical sequence of ward rounds.

While computer-supported learning proved effective in various ill-structured contexts [3], it is unknown, whether the results can be transferred to script development. This project thus is driven by the question, how a computer-supported learning environment can facilitate script development. We designed a case-based computer-supported learning environment in which students watched ward round videos. Prompts were used as scaffolds for learning [3]. We used

- engagement reflection prompts guiding students' attention to opportunities for knowledge construction between physicians and students, and
- sequence reflection prompts scaffolding individuals' understanding of the course of ward rounds.

Methods: We used a 2-2 factorial design with the factors "engagement reflection prompts" and "sequence reflection prompts". 200 students in their sixth to eight semester who successfully completed their one-week-clerkship in internal medicine will participate in the study until January 2015. Learning success is measured through a paper-based version of the structure-formation-technique [4]. The possible impact of mediating variables, i.e. grades, practical experience, will be assessed.

Expected Results and Discussion: We assume that students who receive one particular prompt succeed mainly in the corresponding aspect (understanding the potential for knowledge construction vs. sequential understanding), while students who receiving both prompts show improvement in both types of knowledge. Our results contribute to both the development of our ward round training, and to prior research on script development [5].

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Unravelling elements of quality culture(s) in higher education

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Introduction: The 'quality culture' concept entails that Higher Education Institutions should pay attention to both a structural dimension of quality management procedures as well as a cultural/psychological dimension influencing organisational practices [2]. Although the significance of striving for a quality culture seems indisputable, consensus is lacking on distinctive elements of such a culture [1]. This study systematically reviews empirical research to identify the main elements of quality culture(s) in Higher Education and the way in which they relate.

Methods: The systematic review included 7 databases, which were searched by using a combination of the key search terms 'quality culture', 'quality management', 'higher education' and 'improvement'. The search strategy yielded a total of 1622 articles. After application of selection criteria, 26 studies were incorporated. Analysis focused on identifying elements and their interrelationships, which are backed-up by empirical evidence in terms of their impact on enhanced quality management practices/educational improvement.

Results: Ten elements distinctive to quality culture(s) in higher education were identified. The six structural dimension related elements are: embedded quality management strategies & policies, training & development, clear responsibilities, effective communication, implementation time, stakeholder involvement. The four cultural/psychological dimension related elements are: transformational & quality-supportive leadership, shared values, staff ownership & commitment, teamwork. Leadership, commitment and communication stood out as central binding concepts in the interaction between elements.

Discussion: The body of evidence underpinning 'working elements' of the quality culture concept is mainly focused on its 'hard' structural dimension, while research on the 'soft' cultural/psychological dimension is scarce. As both dimensions can be considered important and are expected to act in synergy, empirical studies on 'soft' elements and the way they interact with 'hard' elements are needed. The identified quality culture elements and their interactions can serve as starting point for organisations aiming to nurture a quality culture which fosters continuous educational improvement.

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Under which conditions can multisource-feedback improve clinical performance: development of a model using a mixed-method-approach

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Introduction: Feedback is considered to be one of the most important drivers of learning [1]. It is helpful for defining learning needs and shaping learning activities and to increase performance. In medical settings Multisource-feedback (MSF) is a recognized form of feedback that is said to help monitor, develop, maintain and improve physicians` performance [2]. At present, there is no comprehensive model of contributing or hindering influences on MSF and its consequences [3]. Also, little is known about the mechanism of how multisource-feedback in the clinical setting influences both learners e.g. junior doctors and their supervisors [[4].

Research questions: In this PhD-project I will address the following research questions:

1. Which is the validity evidence of a newly developed German MSF instrument?
2. Which factors do contribute to or hinder successful MSF to ultimately improve clinical performance? How can these factors and their relationships be visualized in a model?
3. Can this model be confirmed by quantitative studies?

Methods: First, I will validate a newly developed German multisource-feedback questionnaire taking several sources of validity evidence into account [5]. MSF will then be implemented at one hospital using this instrument. Second, a model of influences on MSF and its effects will be generated using grounded theory with help of e.g. focus groups and interviews. Influences and effects of the following factors will be investigated: instrument, assessors, supervisors, trainees, and context factors. Third, in a quantitative study, this model will be validated in a bigger sample of doctors-in-training using questionnaires and applying multi-level analyses.

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Does peer-to-peer dialogue improve understanding of teachers' written feedback and enhance academic writing?

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Introduction: Academic writing is an important but complex competence to be acquired in higher education. A major problem is that students struggle with academic writing. Written feedback given by teachers is not well understood by students because teachers often use academic discourse [3]. As a consequence, teachers' written feedback does not help students to move forward. A promising innovative strategy to enhance processing of teachers' written feedback is peer-to-peer dialogue [1]. Peers use a language that is easily understood by fellow students and they are cognitively more congruent than teachers due to which the feedback is better understood [2]. Furthermore, peer-to-peer dialogue involves arguing, explaining and clarifying, which enhances negotiation about what is meant with the teachers' written feedback which moves the student forward [1]. The research question is: To which degree does peer-to-peer dialogue improve understanding of teachers' written feedback from the students' perceptions?

Methods: 64 Second year students of Biomedical Sciences at Maastricht University, discussed teachers' written feedback in groups of 3-4 students facilitated by a researcher. A questionnaire was used to measure to which degree teacher's written feedback was understood by the students before and after the peer-to-peer dialogue in terms of feed-up, feedback and feed-forward [4].

Results: The scores on the questionnaire demonstrated an improved understanding of the feedback after the dialogue. In addition, students reported that they better understood how to rewrite and improve the text after the peer-to-peer dialogue (feed-forward).

Discussion: Peer-to-peer feedback dialogue enhances understanding of teachers' written feedback on how to move forward and rewrite the text, which is crucial for academic writing. Further research is needed to which degree peer-to-peer dialogue on top of the teachers' written feedback does result in better writing products and under which conditions.

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"In situ" versus "off site" simulation: Healthcare professionals' experience of simulation-based learning; a qualitative study

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Introduction: Recently many have argued for simulation-based medical education (SBME) to be conducted as 'in situ simulations' (ISS) instead of 'off site simulations' (OSS). ISS means SBME in the patient care unit, and OSS means away from the patient unit. ISS is believed to increase fidelity and hypothesised to be more effective [1]. We wanted to explore the effect of simulation setting. Our research question was: How does the setting of simulation-based training (OSS or ISS) affect the learning experiences of health professionals?

Methods:

Design: Qualitative study using focus groups. Data-analysis was done by conventional content analysis. Participants: Four focus groups with 25 multi-professional participants recruited among 97 in a randomized trial investigating the effects of ISS versus OSS [2].

Setting: Obstetric and anaesthesia high-risk departments, Rigshospitalet, Copenhagen.

Results: Around six themes were identified. Initially the participants had a preference for participating in ISS. However, this changed after the training, and the importance of simulation site appeared to be of less importance. We identified a strong preference for simulation in authentic roles in own institution. Several positive and negative factors in simulation were identified and these had no correlation with the setting of simulation. Both ISS and OSS generated better understanding and collaboration between the health professionals and provided individual and team reflections on learning. ISS encouraged more organisational practical learning than OSS.

Discussion: The preference for participating in ISS changed after training. Simulation in authentic team, own role and organisation seemed to be more important, than whether the setting was ISS or OSS. This perception contrasts with recommendations in the literature about cross training, i.e. training in other role [3]. We concluded that the setting of simulation to be of less importance for individual and team learning, and this conclusion is in alignment with recent discussions on fidelity and learning [4], [5].

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Under which circumstances is workplace-based assessment effective? Development of a model using a mixed method approach

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Introduction: To provide support and to structure learning of junior doctors workplace-based assessments (WPBA) have widely been introduced. WPBA is a tool to give formal feedback in an every-day working situation and thereby enhance workplace-based learning [2]. So far, it is still not well understood which factors support and which hinder effective WPBA [1].

In my PhD-project I will address the following research questions:

1. Which are facilitating and hindering factors for effective WPBA and reasons for that on the context level (e.g. dedicated time for WPBA encounters), the assessors' level (e.g. willingness and ability to give 'painful' feedback in a constructive way) and the candidates' level (e.g. actively seeking clarification of unspecific feedback) as perceived by medical students, residents and assessors?
2. Can these factors and their contextual relationships be supported by quantitative studies?

Methods: Based on a qualitative approach using grounded theory and a comprehensive literature research factors will be generated which determine effective WPBA as perceived by medical students, residents and assessors from different clinics. Within this qualitative approach a model of effective WPBA will be developed which finally shall be validated using quantitative methods and multi-level analyses [3].

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Poster Session 2

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Patterns in students' self-regulated learning behavior in the clinic

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Introduction: Good self-regulated learning is important because it has a positive effect on learning [1]. In the clinical workplace the importance of good self-regulated learning skills is even more evident because students are expected to take control of their own learning process [2]. Little research has studied students' self-regulated learning in the clinical environment [3], [4]. To support good self-regulated learning in individual students it would be useful to see if, and if so what, patterns can be identified in students' self-regulated learning behavior in the clinic.

Therefore our research question was: what patterns in students' self-regulated learning behavior in the clinic can be identified, and what are its most important features?

Methods: We chose to use a Q-methodology for our study, which encompasses both qualitative and quantitative features [5]. The Q-methodology is developed for the systematic investigation of people's viewpoints regarding a specific topic, by having them sort statements. The Q-methodology clusters individuals with a similar perspective together to create patterns, rather than clustering questions together to create dimensions.

75 clerks from one university in the Netherlands enrolled in this study, they were in various stages of their undergraduate education and were enrolled in various clerkships. A digital system was used to conduct this study. Participants were asked to sort statements on a "totally disagree" – "totally agree" scale, according to a fixed, bell-shaped distribution. 67 statements representing all aspects of self-regulated learning were used, which were distilled from a previous interview study on clinical students' self-regulated learning.

Results: This study is currently being conducted, no results can be given yet, however we estimate that we have the results before the PhD/MME Research Day takes place.

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Developing an alternative response format for the script concordance test

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Introduction: Clinical reasoning is essential for the practice of medicine. In theory of development of medical expertise it is stated, that clinical reasoning starts from analytical processes namely the storage of isolated facts and the logical application of the 'rules' of diagnosis. Then the learners successively develop so called semantic networks and illness-scripts which finally are used in an intuitive non-analytic fashion [1], [2].

The script concordance test (SCT) is an example for assessing clinical reasoning [3]. However the aggregate scoring [3] of the SCT is recognized as problematic [4]. The SCT`s scoring leads to logical inconsistencies and is likely to reflect construct-irrelevant differences in examinees' response styles [4]. Also the expert panel judgments might lead to an unintended error of measurement [4].

In this PhD project the following research questions will be addressed:

1. How does a format look like to assess clinical reasoning (similar to the SCT but) with multiple true-false questions or other formats with unambiguous correct answers, and by this address the above mentioned pitfalls in traditional scoring of the SCT?
2. How well does this format fulfill the Ottawa criteria for good assessment, with special regards to educational and catalytic effects [5]?

Methods:

1. In a first study it shall be assessed whether designing a new format using multiple true-false items to assess clinical reasoning similar to the SCT-format is arguable in a theoretically and practically sound fashion. For this study focus groups or interviews with assessment experts and students will be undertaken.
2. In an study using focus groups and psychometric data Norcini`s and colleagues Criteria for Good Assessment [5] shall be determined for the new format in a real assessment. Furthermore the scoring method for this new format shall be optimized using real and simulated data.

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Watching People Fail: Improving Diagnostic Competence by Providing Peer Feedback on Erroneous Diagnoses

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Fostering diagnostic competence and error detection skills are important for diagnostic accuracy in medicine. Teaching these skills is difficult but essential for medical education. Doctors and medical students regularly face problems when performing accurate diagnoses, even with increased expertise. Cognitive modeling shows great promise to foster learning of such competences [1]. In the present study this involved observing a peer perform a cognitive task while explaining the rationale behind it. To increase elaboration of the observed performance, errors can be built into the example [3]. Providing peer feedback on these errors seems promising to increase error detection and elaboration [2]. A video based intervention was created on the basis of erroneous cognitive modeling and implemented in a seminar for advanced medical students in the clinical part of their studies. The students provided feedback to a video-taped peer student performing a differential diagnosis of the guiding symptom dyspnea. The study was designed as a 2x2 design with the following factors:

1. (Students either had to provide feedback to the peers in the video or just watched the videos, and
2. the videos they watched showed erroneous versus correct diagnoses.

A control group was instructed to learn from a textbook how to diagnose and was compared to the four modeling conditions. Thus far, a pilot study has been conducted (N=12). The main study (N=160) is ongoing and will be finalized in January 2015. Results of the pilot revealed a positive relationship between the quality of peer feedback and diagnostic competence after working with the erroneous modeling examples. Additionally, a comparison between erroneous and correct diagnoses showed that providing peer feedback on observed erroneous diagnoses seems to foster error detection skills in a transfer task.

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Feedback on leadership during residency training: A framework analysis

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Introduction: Physician leadership is an important precondition for good, safe and efficient health care [1]. According to the "Medical leadership Competency Framework" (MLCF), every physician should be competent in the following leadership domains;

1. developing personal qualities,
2. working with others,
3. managing services,
4. approving services,
5. setting directions [2].

However, leadership is not yet mentioned as an explicit role in the CANMEDS framework. We studied whether leadership competencies are nonetheless addressed in written feedback on CANMEDS competencies. If so, we examined which themes are addressed and how they relate to the MLCF

Methods: We received 591 feedback forms of internal medicine residents from training hospitals of University of Groningen, the Netherlands. On these forms, residents received feedback on CANMEDs competencies. We performed a framework analysis on all feedback comments regarding leadership and identified a thematic framework for coding leadership feedback. Subsequently, we piloted leadership feedback on the framework. In the next step we charted all the feedback on the framework. Concluding, we interpreted the data with the MLFC in mind.

Results: 77 forms contained leadership feedback. A total of 120 comments were analyzed. The framework analysis resulted in five themes:

1. personal leadership; taking charge of professional growth,
2. multidisciplinary collaboration
3. management of staff and time. These themes fitted into the first three of the five domains of the MLCF.

We found two additional themes

4. vision and
5. directions for patient care that did not fit into the MLCF.

Discussion: Residents receive feedback on three leadership competency domains of the MLCF. Feedback was lacking in the domains approving services and setting directions. We wondered whether this was due to the feedback situation or whether these competencies do not fit the work situation of residents. We studied written feedback and now wonder whether and how an observational study would be of added value to the current study.

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Simulation-based obstetric anaesthesia training conducted 'in situ' versus 'off site' leads to similar individual and team outcomes; a randomised controlled trial

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Introduction: Obstetric emergencies are rare and simulation-based medical education (SBME) is essential for learning. However, we don't know how SBME conducted as 'in situ simulations' (ISS) versus (vs.) 'off site simulations' (OSS) impact learning. ISS is believed to increase fidelity, and is hypothesised to be more effective [1]. Research question: What are the effects of ISS vs OSS on individual learning, safety attitude, motivation, stress, team performance and organisational impact?

Methods:

Design: Randomised trial conducted April-June 2013 [2].

Setting: Obstetric and anaesthesia high-risk department, Rigshospitalet, Copenhagen.

Participants: 100 recruited among midwifes, nurses, trainees and consultant doctors from obstetrics and anaesthesiology, anaesthesia and surgical nurses.

Interventions: The same two simulations (management of emergency caesarean section and postpartum haemorrhage) were conducted in teams of ten as either ISS or OSS.

Primary outcome: Multiple choice question test.

Exploratory outcomes: Safety Attitudes Questionnaire, stress inventories as Stait Trait Anxiety Inventory and Cognitive Appraisal, salivary cortisol, Intrinsic Motivation Inventory, questionnaire evaluating perceptions and suggested changes needed in the organization, a team-based score on video-assessed performance.

Results: No differences between the two groups were found for any of the individual or team scores except for the ISS-participants scored the authenticity significantly higher. More ideas for changes on the organisational level were suggested from the ISS-participants.

Discussion: Perceptions of the authenticity differed significantly between ISS and OSS-participants, but it did not affect other individual or team outcome. In non-randomised trials, it is argued that ISS has greater fidelity and thereby expected to increase levels of learning, but this was not confirmed in this trial [1]. The results add to the discussion about dimensions of context and contributions to learning [3]. In this study, the assumption that high fidelity simulations (as ISS) lead to better learning was not supported and this add to recent discussion on fidelity and learning [4], [5].

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Pedagogical methods for developing scientific reasoning and argumentation skills in higher education

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In the life sciences, two pedagogical methods are typically used to develop scientific reasoning and argumentation (SRA) competencies specific to research methods and experimentation: laboratory exercises (LEs) and research experiences (REs). Less frequently utilized – though more commonly advocated for – are case-based reasoning exercises (CBEs) similar to those popularly used in medical education. Limitations within LEs and REs have been widely discussed in science education literature and CBEs that target SRA specific to research methods could serve as a bridge to the aspects of SRA hindered in LEs and REs.

To our knowledge, no single study has directly compared the effects of these three pedagogical methods on SRA learning or performance. Thus, this study applies meta-analysis to SRA literature from higher education settings in order to evaluate 1) the effect of SRA interventions on SRA performance, 2) potential variability of effect between LEs, REs, and CBEs on SRA performance, and 3) characteristics of the intervention and assessment study that may moderate the observed effect. Pre-

liminary results from a subset of the papers under review for inclusion in the analysis (k=20 [k_T>85]) indicate a significant positive effect of SRA interventions on SRA post-test performance and support the use of a random effects model. The preliminary results also indicate significantly different moderation effects for the moderator category *pedagogical method*, along with several other categories characterizing the reviewed interventions and assessments. Of note, the moderator category *instructional delivery method* exhibited significantly different and independent moderation effects (subgroups: *guided instruction* and *digital learning environment*).

Additional studies are currently under review for inclusion in the meta-analysis as a more substantive analysis is necessary to fully understand the varying effects of these *pedagogical methods* and perhaps unveil how they could be used synergistically to mitigate the limitations respective to each SRA pedagogical method.

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