

# The 'renewed' European Diploma in Intensive Care examination: an evidence-based change

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## Main message bullet points

- In Europe, the Competency-based Training in Intensive Care in Europe (CoBaTrICE) collaboration coordinates attempts to ensure a common standard for clinical competence in the intensive care unit.
- The European Diploma in Intensive Care Medicine (EDIC) consists of two parts: a theoretical part I, and a clinical part II. The clinical part of the EDIC has recently been changed incorporating Objective Structured Clinical Examination (OSCE) type stations, a variant of which had previously been used for many years in the Netherlands.
- Analysis of the four-year Dutch examination data supports moving away from the clinical bedside assessment towards OSCE-type examination stations.

## Abstract

**Introduction:** In the Netherlands summative end-of-training clinical assessment of Dutch intensive care medicine trainees is performed using the European Diploma in Intensive Care Medicine (EDIC) format. The format for this EDIC part II exam has recently changed, moving away from the clinical bedside assessment towards Objective Structured Clinical Examinations (OSCEs).

**Methods:** A national study using all examination data for the Netherlands in the period 2010 to 2013 was initiated. The goal was to identify whether, and to what extent, the different components of the clinical part (II) of the EDIC exam (the OSCEs (paper-based, clinically oriented cases) long case (bedside, clinical) and short cases (bedside, clinical)) correlated in order to determine whether moving away from the clinical, bedside EDIC assessment in the 'renewed' EDIC exam is

supported by the data.

**Results:** Pearson correlation of the OSCE score with the long case and short cases score was moderate to strong and significant (0.43 and 0.37, at the 0.01 level and 0.05 level, respectively). Correlation of the long case score with the short cases score was moderate (0.28) and non-significant. Factor analysis revealed only one factor with an eigenvalue above 1. The OSCE component of the EDIC II exam contributed most strongly to this factor, followed by the long case and short cases. **Conclusion:** The study's findings support moving away from the clinical bedside assessment, towards OSCE type examination stations as are now incorporated in the recently introduced revised summative EDIC II examination framework.

## Introduction

Over the last decade a shift can be observed towards defining curricula in terms of educational outcomes through competency-based training. This development can particularly be noted at graduate and specialist residency level.<sup>[1-5]</sup> This is also the case for intensive care medicine. In the United Kingdom, a comprehensive competency-based training programme for intensive care medicine was developed in 2001.<sup>[6]</sup> In Europe the Competency-based Training in Intensive Care in Europe (CoBaTrICE) collaboration is coordinating a comparable process, to ensure a common standard for clinical competence in the intensive care unit (ICU). CoBaTrICE is an international collaboration managed by the European Society of Intensive Care Medicine's division of Professional Development, and endorsed by the European Board of Intensive Care Medicine and the national training organisations of 28 European countries. The CoBaTrICE programme has now been adopted by 15 European countries, with another 12 countries planning to adopt it.<sup>[7]</sup> The core knowledge, skills, attitudes and associated competencies

resulting from a training programme would be similar for all physicians although trained in different countries. CoBaTrICE uses survey and consensus techniques, combined with expert opinion and external consultation, to develop the component parts of an internationally acceptable competency-based training programme for intensive care medicine for Europe and collaborates on this subject with representatives from other world regions.<sup>[8-10]</sup> As a result of its efforts, the CoBaTrICE programme published competencies for an international training programme in intensive care medicine in 2006, having used more than 5000 suggestions by over 500 respondents worldwide.<sup>[11]</sup> In competency-based intensive care training programmes, in-training assessment (i.e. past assessment in the workplace while 'on the job', 'at work') is performed using workplace-based assessment instruments.<sup>[12,13]</sup> Furthermore, end-of-training assessment is preferably performed using the two part European Diploma in Intensive Care (EDIC) exam, consisting of a theoretical part I, and an oral/clinical part II. Recently, 12 out of 33 countries used the EDIC as the national examination format, and six required a pass on this exam for certification of intensivists training.<sup>[7]</sup> The format of the EDIC exam in the Netherlands has recently changed (see Methods and Context), moving away from clinical bedside assessment. In the process of quality assurance and future quality improvement, the general structure of the 'old-style' oral/clinical EDIC part II has been re-evaluated to see whether statistical analysis of the EDIC examination data support the recent change. A national study using all examination data for the Netherlands over a four-year period was initiated to identify whether, and to what extent, the different components contributed to the exam.

### Methods and context

The study includes the isolated and aggregated results on the different components of the oral/clinical EDIC II exam for all Dutch intensive care medicine trainees who participated in the exam in the Maastricht University Medical Centre Maastricht, the Netherlands, between 2010 and 2013. The Maastricht University Medical Centre is an academic tertiary care referral medical centre, with a 33-bed mixed intensive care unit. Exam results were prospectively collected.

#### *European Diploma in Intensive Care exam*

The EDIC examinations are traditionally set out in two parts: Part I - the written exam<sup>[14]</sup> and Part II - the oral/clinical case exam. Both parts must be passed to obtain the EDIC diploma. The aim of the written exam (EDIC part I) is to test specific theoretical intensive care medicine knowledge, whereas the oral part (EDIC part II) aims to test the competencies, expertise and professional behaviour at the end of specific training (2-3 years) in intensive care medicine.

The theoretical EDIC part I exam consists of a 100-question multiple choice knowledge test, covering the entire spectrum of

intensive care medicine topics, and is taken by all participants at the same time during the annual ESICM conference or at a national geographical central location, e.g. in the Netherlands. After successfully passing the EDIC I exam, candidates can, so far voluntarily, participate in the clinical EDIC part II examination which, until recently, was hosted in Maastricht, the Netherlands.

In the study period, EDIC part II consisted of a so-called long case scenario, in which a candidate gathered all relevant medical information on a real patient in the intensive care department using all available data resources, including the patient data management system, interaction with the critical care nurses, and was asked to perform a state of the art physical examination, followed by an in-depth case-based discussion, lasting an hour. Two bedside discussions on so-called short, real patient-based cases followed. These cases, each lasting 15 minutes, focussed in particular on specific and detailed disorders and/or interventions of specific patients in the ICU. Thereafter eight to ten Objective Structured Clinical Examination (OSCE) type stations followed. During the OSCE, candidates rotate through a series of rooms in each of which there is an examiner with a checklist and rating scale, and an assignment for the candidate, e.g. a short paper-based clinical scenario or an interpretation of laboratory and imaging results.<sup>[15,16]</sup> Long cases were assessed by two assessors using a checklist with scores on the different sub-competencies, resulting in a single, global consensus score from 1-10. Short cases and OSCEs were assessed by one assessor, using the same numerical, global consensus scale. An aggregated score was calculated from the score for the long case, the mean score of the short cases, and the mean score of the OSCEs. A score less than 6 for the long case could not, however, be compensated for by higher scores for the short cases and the OSCEs, and resulted in a fail for the exam as a whole.

The format of EDIC part II was unaltered over the study period. Examination was performed by senior staff members and chairs of all intensive care training centres in the Netherlands. Nowadays, the revised format, new EDIC part II includes 3-4 short scenarios with patient charts and at least 3-4 computer-based stations with seven centres across Europe hosting the exam,<sup>[14]</sup> thus moving away from the bedside to OSCE-type stations.

#### *Data analysis*

IBM SPSS Statistics, release 21.0.0.1, was used for statistical analysis.<sup>[17]</sup> Descriptive statistics were performed. The relations between scores of the long case, short cases and OSCE type stations were investigated by calculating bivariate Pearson correlations. Exploratory factor analysis (principle component analysis) was performed to explore the relative contribution of the components of the EDIC part II exam. Eigenvalues represent the amount of variation in the sample accounted for by each factor. A factor with a low eigenvalue contributes

little to the explanation of variance in the variables. Factor loadings are the correlation coefficients between the measured variables and the explaining factors, so present how much a factor affects the variables. The operational definitions of the effects size of correlation coefficients, according to Cohen, are:  $r \pm 0.10$ , small, negligible practical importance);  $r \pm 0.30$ , medium, moderate practical importance; and  $r \pm 0.50$ , large, crucial practical importance).<sup>[18]</sup>

## Results

In the four-year study period 45 candidates, 27 males and 18 females, representing all Dutch training centres, participated in the national Dutch EDIC part II exam. All candidates, with one exception, passed the EDIC part II. Test scores on the different components of the exam, as well as the aggregated test scores are provided in *Table 1*.

**Table 1.** Test scores on the different components of the oral/clinical European Diploma in Intensive Care part II exam

	Number of candidates	Mean score	Range	SD
Long case	45	7.5	5.5 - 10	.91
Short cases	45	7.6	6.0 - 9.5	.78
OSCE	45	7.7	6.5 - 9.1	.62
Overall	45	7.6	6.6 - 9.2	.58

SD = standard deviation

Pearson correlation of the OSCEs with the long case and short cases was moderate to strong and significant (0.43 and 0.37, and significant at the 0.01 level and 0.05 level, respectively). Correlation of the long case with the short cases was moderate (0.28) but non-significant.

Factor analysis revealed only one factor with an eigenvalue above 1, explaining 57% of the variance observed. The OSCE component of the EDIC II exam contributed most strongly to this factor, followed by the long case and short cases (factor loadings amounting to 0.81, 0.76, and 0.70 respectively).

## Discussion

This study explored the relative contribution of the three different components to the oral/clinical EDIC part II over a four-year period in the Netherlands. The results reveal a moderate to strong correlation of the OSCE between the long and short cases, respectively, and a moderate correlation between the long case and the short cases. Results suggest examination by using OSCE-type stations, as implemented in the recently revised summative EDIC II examination frameworks, may yield results comparable with the clinical bedside assessments using short and long cases in the former EDIC exam format.

The findings will consecutively be discussed in the perspective of the medical education literature on assessment in general and

contemporary developments in assessment in intensive care medicine specifically.

### *Assessment in general*

Assessment is a fundamental component of any high-quality training programme.<sup>[12]</sup> Assessment has a strong impact on how and when students learn: assessment drives learning.<sup>[19]</sup> Learning occurs faster, and leads to better retention of the subject matter studied when learning takes place within a relevant and realistic context. The ICU is eminently suited for the purpose of learning and assessment on-the-job, also known as workplace-based assessment.<sup>[11,20,21]</sup> This formative aspect of assessment is driven by constructive feedback. Summative assessment on the other hand means making a 'go, no-go' or 'pass, fail' decision, serves a certifying role, and ensures that only competent and qualified intensivists enter intensive care medicine healthcare practice.

### *Assessment in intensive care medicine*

Consequently, the lack of formal assessment may undermine the impact of teaching during the intensive care training programme.<sup>[12,22]</sup> Restructuring of the intensive care training programmes focussing on improving teaching and learning, for example using workplace-based assessment, is a contemporary phenomenon strongly supported by e.g. CoBaTrICE.<sup>[13]</sup> Driven by the evidence on summative assessment from the medical education domain, EDIC exams are likewise 'meticulously developed and continuously updated to create standard European exit exams, which accurately reflect clearly defined assessment goals and address the necessary skills, attitude, competencies and knowledge required for intensive care practice.'<sup>[14]</sup> In general, assessment frameworks such as EDIC II should preferably meet the criteria of validity, reliability, feasibility (to which cost is a major contributing element) and acceptability (by all stakeholders).<sup>[23-26]</sup> Apart from these elements, the impact on education and learning is of importance.<sup>[23]</sup> The 'utility' or usefulness of an instrument is a function of the relationship between several elements, and in daily practice compromise is inevitable.<sup>[26]</sup> In high-stakes examinations, such as the EDIC part II exam, reliability will have higher priority, while in formative, workplace-based assessment educational impact is perhaps more relevant.<sup>[23]</sup> It can easily be envisaged that hosting the EDIC part II exam, which includes long and short clinical cases with bedside observations and discussions with 10-15 participants in the clinical setting of a busy intensive care department with critically ill patients, is a major challenge for the organising committee including secretarial staff, the nurses on the ward, and the physicians on call. A significant contribution is also made by the patients and their relatives willing to provide informed consent for participation, with patients undergoing repeated physical examinations by several exam candidates. When applying the utility criteria to the traditional EDIC II framework, in the perspective of the context

painted above, one may wonder whether changes in the EDIC II format used so far are required. From a practical perspective, in the authors' opinion this would mean a shift in the direction of OSCE type stations away from the bedside assessment currently in place using the long and short cases, a direction suggested on the CoBaTrICE website.<sup>[13]</sup>

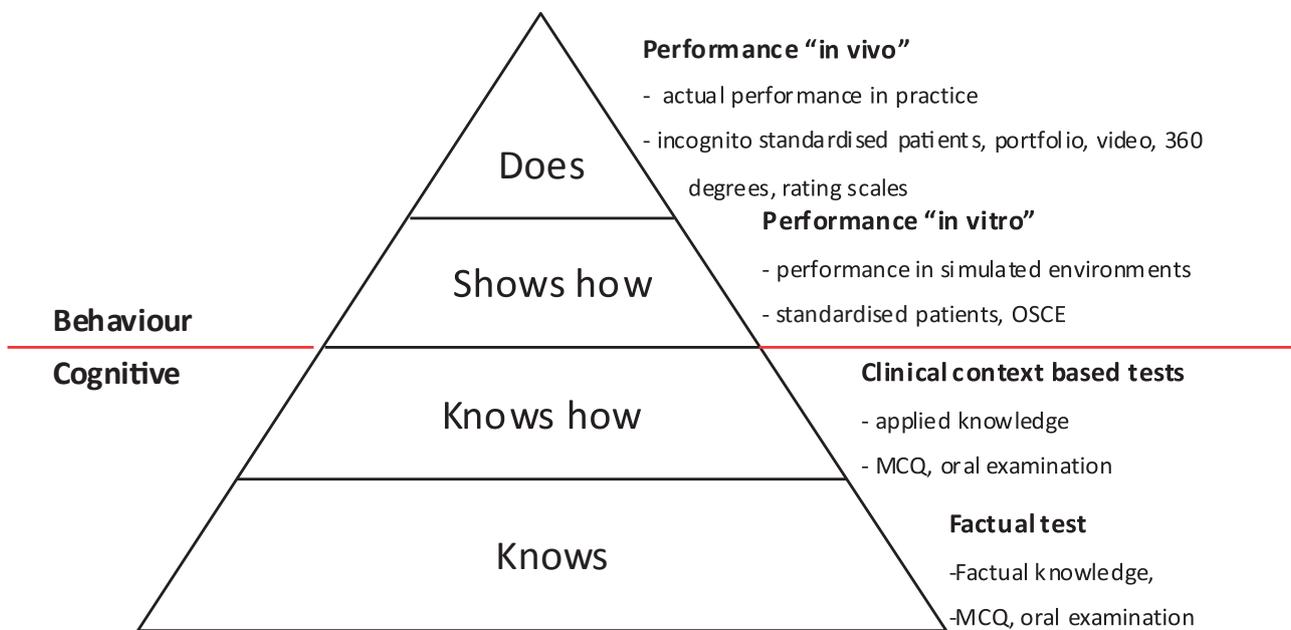
This practical perspective is supported by contemporary formative assessment practices.<sup>[12]</sup> Miller's pyramid is often used to illustrate the relative position of commonly used competence and performance assessment instruments (*figure 1*).<sup>[27]</sup> Workplace-based assessment aims to measure performance in everyday practice, and is at the top of the pyramid. The OSCE is just below the top of the pyramid, and has been used for both formative (feedback) and summative purposes, the latter e.g. as a high-stakes tool in the United Kingdom Royal College of Physicians membership examinations.<sup>[15,16]</sup> When combining multiple in-training, workplace-based assessment (triangulation), in a context as realistic as possible (the ICU, in everyday practice), with multiple, trained observers over a longitudinal trajectory with adequate follow-up, and with ample opportunities for remediation, the necessity for using a clinical context during the end-of-training EDIC II exam has perhaps become surpassed.

The results of the study presented here provide further support for a shift towards assessment frameworks using OSCE-type stations, and away from the clinical long and short cases without thus a priori compromising reliability.

**Strengths and limitations**

A strength of this study is the statistical analysis. The sample of candidates, all participants in the EDIC exam over a four-year period, the tests and the obtained scores and their relations (measured by the correlation coefficient) are representative of the investigated assessment procedures. During the four-year period only one candidate failed the exam. A low number of negative results in the dataset negatively impacts on the chances of finding a strong correlation. Such restriction of range would thus decrease the observed correlation. The interpretation of the effect size of the correlation coefficient was based on the well-established classification by Cohen.<sup>[18]</sup> In addition it should be acknowledged that the observed correlation is often an underestimation of the true correlation since the observed variables are disturbed by noise.<sup>[28]</sup> The results of the analysis were not only summarised by correlation coefficients but also by the loadings of a factor analysis, as a more direct indication of the correlation of the measured variables with the candidate's ability. The factor was found to be maximum for the OSCE, amounting to a considerable value of 0.81. Therefore, these factor analysis results were presented in addition to the raw observed correlations.<sup>[29]</sup>

Nevertheless, the 'old' EDIC exam was in many ways different to the currently used EDIC format in Amsterdam, with a more extensive use of the OSCE carousel, and a higher percentage of foreign candidates resulting in a different success rate. These changes in format of the EDIC, the nature of the participants as well as contemporary changes in intensive care training



MCQ = multiple choice questions; OSCE = objective structured clinical examination

**Figure 1.** The framework for assessing competence as proposed by Miller: Miller's pyramid<sup>27</sup>

curriculum content, and the increasing use of workplace-based assessment instruments may obviously impact on the intensive care medicine trainees' study behaviour and preparatory activities for summative examinations.<sup>[14]</sup> The relationship between the different components of the 'new' EDIC II may consequently change as well, necessitating planned iterative qualitative re-evaluation.

### Conclusion

The OSCEs correlated moderately to strongly with the clinical long and short cases in the traditional clinical European Diploma in Intensive Care Medicine exam. Factor analysis revealed only one factor providing further support for the relationship between the three EDIC II exam components, with the OSCEs most strongly contributing to this factor. These findings, combined with issues regarding practical acceptability and feasibility, support moving away from the clinical bedside assessment, towards OSCE type examination stations as implemented in the recently revised summative EDIC II examination frameworks.

### Disclosure

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