IIAI Open Conference Publication Series
IIAI Letters on Institutional Research
Vol.004, LIR264
DOI: https://doi.org/10.52731/lir.v004.264

A Trial to Convert Graduation Competency Questionnaire Data into Key Performance Indicators in Japanese Medical Schools

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Abstract

Introduction: The monitoring of graduation competencies is a crucial issue for institutional research (IR) for medical schools in terms of accreditation. To enable the comparison of the acquisition of competencies across universities, the current study aimed to achieve better quality assurance by converting data disclosed in graduation competency questionnaires into key performance indicators (KPIs). Methods: First, we conducted a Google search of 82 Japanese universities regarding the disclosure of information on graduation competencies and examined the characteristics of universities that fit the criteria. The graduation competencies of the targeted universities were then examined and categorized into newly revised common national competencies followed by the ranking of data and the calculation of averages. Finally, comparisons of the competency data of the universities were conducted. Results: Twelve universities met the criteria and exhibited significant differences in characteristics such as foundation and name. One of the newly revised common national competencies was missing from the existing graduation competencies at most universities. The study observed significant differences in the level of mastery among the competencies, and variations in ranking between the university of the authors and the national average. Discussion and Conclusion: By examining data disclosed in graduation competency questionnaires for universities, converting them into KPIs became possible. This method may also be used to convert other monitoring data into KPIs.

Keywords: Accreditation, Key Performance Indicator, Institutional Research, Graduation Competencies

1 Introduction

Program evaluation is an essential task for institutional research (IR) for quality assurance in higher education. Especially, the monitoring of program evaluation in medical schools is reported to lag nationally compared with other countries in terms of accreditation based on the World Federation for Medical Education (WFME) Global Standards for Quality Improvement in Medical Education [1, 2]. The data collection for IR in terms of program evaluation includes a wide range of hard data (e.g., grade point average and national exam pass rates) [3] and soft data (e.g., course evaluation survey and curriculum questionnaires) [4]. However, the self-assessed monitoring of graduation competencies is typically performed for the accreditation of medical

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schools [5]. Competency pertains to diverse knowledge, abilities, skills, experiences, and behaviors that lead to effective performance in the activities of individuals [6]. In the context of higher education, a typical requirement of the diploma policy is that students acquire the graduation competencies defined by their respective medical schools. Furthermore, the level of achievement of graduation competencies in medical schools is crucial as an indicator for the measurement of the quality assurance of education from the perspective of medical safety [6,7]. For example, in the 1990s, Canada developed CanMEDS, a set of national common frameworks that provide comprehensive competencies for medical education and practice [8], and similar frameworks were introduced in the United States and the United Kingdom [9, 10]. In Japan, the Model Core Curriculum for Medical Education was first developed in March 2001, and a section entitled Basic Qualities and Abilities Required of Physicians/Dentists was introduced in Japanese [11]. After three revisions (i.e., 2007, 2010, and 2016), the English version of the section was added in the revision in 2022 [12]. The section defines 10 categories composed of the existing eight (professionalism: PR, lifelong learning: LL, research: RE, problem solving: PS, clinical skills: CS, communication: CM, interprofessional collaboration: IP, and medicine in society: SO) and two additional categories (generalism: GE and information technology: IT, Table.1).

Thus, although the foundation is in place for disseminating the status of acquisition of common competencies in Japan to the rest of the world, no English papers use this information to report the aggregated results of the monitoring of graduate competencies. Alternatively, the expansion of this accreditation of medical schools has led to the development of IR-based program evaluation [1, 13]. Although limited due to personal information protection, several universities disclose the results of the monitoring of graduation competencies to the public through their websites. They demonstrate that certain commonalities exist in graduation competencies across universities [14]. Therefore, this study aims to determine the current status of disclosed data of graduation competency questionnaires, classify them using the Basic Qualities and Abilities Required of Physicians/Dentists, and convert them into key performance indicators (KPIs). The objectives are to understand the common and different areas of achievement of graduation competencies and to investigate the status of competency acquisition in Japan.

2 Material and Methods

First, we conducted a Google search using the keywords “questionnaire,” “medical school,” “competency,” “graduation,” and “disclosure” with the name of each 82 universities. To standardize the conditions of the results, we organized the disclosed data on the self-assessed monitoring of prospective graduates (sixth grade) on the acquisition of graduation competencies. In the case that data from graduation competency questionnaires for prospective graduates for several years were publicly available, data from the most recent year were used. To examine the characteristics of the universities that met the criteria, we conducted Fisher’s exact test with cross tabulation. A p-value < 0.05 was considered statistically significant.

Table 1: Ten categories of the Basic Qualities and Abilities Required of Physicians/Dentists [12]

PR	Professionalism	Acknowledge the professional responsibility of physicians to be deeply involved in people's lives and to protect health; respect diversity and humanity; and take an altruistic approach to medical practice throughout one's career.
GE	Generalism	Take a multi-systemic view of the patient's problems and consider the patient's psychosocial background to provide comprehensive, flexible medical care that responds to the needs of the patient and is not limited to one's specialty, which supports the achievement of individual and societal well-being.
LL	Lifelong Learning	Continuously reflect on one's practice and train collaboratively with other physicians and healthcare professionals by actively engaging in lifelong education and self-directed learning to practice safe and high-quality medical care.
RE	Research	Understand the importance of medical research for the advancement of medicine and medical care and support innovation in medicine through involvement in academic and research activities by developing one's scientific thinking skills.
PS	Problem solving	Acquire knowledge and expertise in medicine and related disciplines and use evidence-based medicine and professional experience to solve problems faced by patients.
IT	Information Technology	Recognize the impact of continuing technological developments on society and make use of information science and technology, such as artificial intelligence, when engaging in medical research and clinical practice.
CS	Clinical Skills	Practice medical care with emphasis on quality and patient safety by giving full consideration of patients' pain and anxiety and by developing reliable and dependable clinical skills.
CM	Communication	Practice safe and high-quality medical care by building good relationships with patients and other people involved in their care, taking patients' own circumstances into account, and supporting them in their decision-making.
IP	Interprofessional Collaboration	Understand the roles of all people involved with patients and their families, including medical care, health care, welfare, and nursing care professionals, and build collaborative working relationships with them, collectively sharing and cooperating on issues that affect patients, their families, and local communities.
SO	Medicine in Society	Recognize that medicine plays a key societal role in promoting health and strive to provide equitable medical care by maintaining an economic, regional, and international perspective to improve public health.

We then organized the graduation competencies of the target universities and our university into the 10 categories of the Basic Qualities and Abilities Required of Physicians/Dentists of the 2022 revision of the Model Core Curriculum for Medical Education (Table 1) [12]. To address the

issue of disparate self-assessment questionnaires, we converted the results of graduation competency questionnaires from numerical values to rank to unify the data. We also calculated the mean and standard deviation of the rank score in each category. In addition, to examine the significant difference between the ranking of each category based on the Model Core Curriculum for Medical Education, we conducted the Kruskal–Wallis test on the data from graduate competency questionnaires. Post-hoc analysis was performed on the data using the Holm method for multiple comparisons of the 10 categories.

Finally, for the identification of items that should improve the education of their university as an example of IR in practice, we examined the strengths and weaknesses of the graduation competencies of our university by comparing the data of all universities with those of our university. R ver. 4.3.1 for Windows was used to perform statistical testing. The Nagoya City University Ethics Committee (date: 14/11/2023, reference number: 60-23-0095) granted ethical approval. The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

3 Results

Using the conditions of the method, 21 universities were hit by the disclosure of questionnaire data on competencies in medical schools. Twelve (private: 10, public: 2) of the universities conducted a survey using self-assessed graduation competencies for prospective graduates. Statistical test by cross tabulation revealed a significant difference between private and public universities in the presence or absence of data disclosure that met the criteria ($p = 0.00103$, odds ratio: 10.58). Eight universities were named *medical universities* and were significantly more fit the criteria than those were not ($p = 0.018$, odds ratio: 4.89). Three of the four universities without *medical university* in their names had medical schools from their establishment (Table 2).

		Foundation	
		Private	Public
Criteria	Yes	10	2
	No	22	48

		named "medical university"	
		Yes	No
Criteria	Yes	8	4
	No	20	50

Table 2: Cross tabulation of the characteristics of 12 universities

Table 3 presents the results of classifying the graduation competencies of the 12 universities and our university under the 10 categories. PR and PS were present for all universities. The newly added category, GE, was present in the graduate competencies of 11 universities, while IT was present in only one.

Fig. 1 presents a box-and-whisker plot of the ranking the self-rated scores of the questionnaires under the 10 categories. PR obtained the highest category (2.23 ± 1.05) followed by CM (2.33 ± 1.11) and LL (2.80 ± 1.25). Conversely, the lower ranked categories were GE (5.73 ± 1.48), SO (5.90 ± 1.30), and RE (6.78 ± 2.20), except for IT, which was only addressed by one university. Multiple comparison tests for each category demonstrated that PR, CM, and LL were significantly different from GE, SO, and RE, respectively (Table.4).

Table 3: Number of universities in which each category corresponds to the content of graduation competencies.

Category	PR	GE	LL	RE	PS	IT	CS	CM	IP	SO
Number of universities	13	11	10	9	13	1	11	12	10	10

Finally, when comparing the rankings of our university and the average of all universities, we did not find any category that displayed a remarkable gap; however, we found a medium gap (two ranks) for PR and GE (Fig. 1).

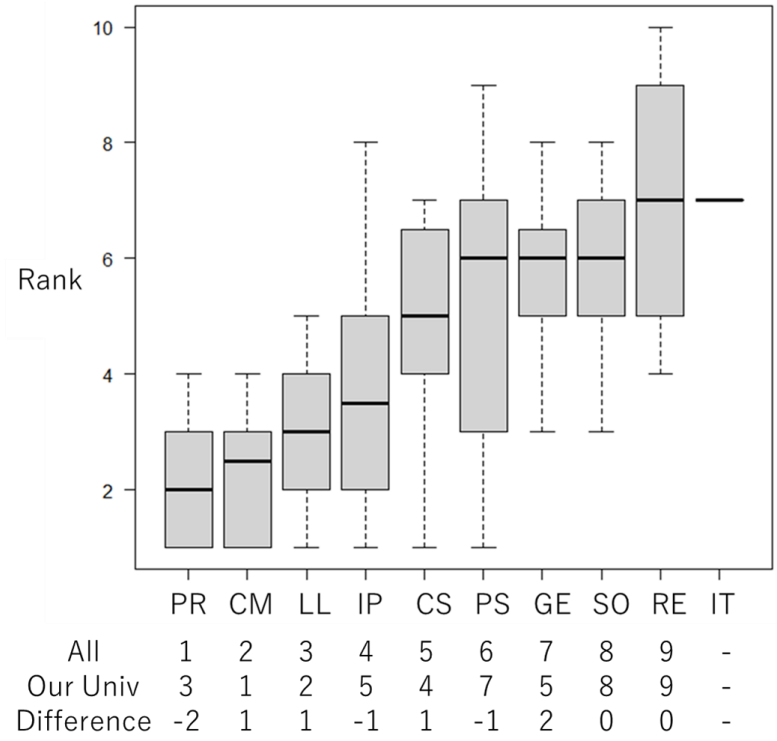

Figure 1: Box-and-whisker plot of ranking of the self-rated scores applied to the 10 categories and comparison between the average of all universities and university.

4 Discussion

This study is the first to report on a survey on the level of graduation competencies acquired across universities after the revision of the Model Core Curriculum for Medical Education in 2022 and the publication of the English version of the "Basic Qualities and Abilities Required of Physicians/Dentists." We attempted to unify the survey data to determine the national survey status of graduate competencies, but this exerting this effort was extremely difficult, because graduation competencies differ across universities. Moreover, the questionnaires varied according to research questions. For example, although 21 universities were hit by Google search with the information disclosure of data from graduation competency questionnaires for medical schools, the implementation of more than 10 universities out of the 61 that were not hit was mentioned in the self-evaluation report based on WFME global standards [2,5] but not information disclosure.

Table 4: Matrix of multiple comparison tests between categories. Gray indicates $p < 0.05$.

	PR	CM	LL	IP	CS	PS	GE	SO	RE
CM	1	-	-	-	-	-	-	-	-
LL	1	1	-	-	-	-	-	-	-
IP	1	1	1	-	-	-	-	-	-
CS	0.2009	0.2203	0.7047	1	-	-	-	-	-
PS	0.1422	0.2203	0.7047	1	1	-	-	-	-
GE	0.0045	0.007	0.0357	0.507	1	1	-	-	-
SO	0.0058	0.0087	0.0302	0.3627	1	1	1	-	-
RE	0.0068	0.0087	0.0418	0.336	1	1	1	1	-
IT	1	1	1	1	1	1	1	1	1

Moreover, out of the 21 universities, 12 used conducted a self-assessment of graduation competencies among sixth-year students, while the other nine conducted a self-assessment after graduation or peer assessments or an *alumni survey* by instructors after graduation. Several universities that met the criteria for the study also conducted self-assessment surveys after graduation and peer assessments at the same time.

The examination of the characteristics of the universities that met the criteria revealed that private universities were significantly more likely than public ones to disclose competencies at graduation using Fisher's exact test. This result would be influenced by grants contributed by private universities through IR disclosure to promote reforms [15]. In terms of the fact that medical universities are significantly more likely than comprehensive universities to disclose graduation competencies, the study assumed that an environment has not been developed to survey and disclose competencies in medical schools, because information is disclosed through headquarters. Evaluation not only for institutions but also for departments is required to promote information disclosure. However, further analysis is needed on the relationship between the characteristics of universities and their status of the acquisition of graduation competencies.

The graduation competency questionnaires of the medical schools were also diverse. Evidently, differences existed in the graduation competencies defined by the universities. The competencies previously described in the Model Core Curriculum for Medical Education were those presented by the majority of universities. Regarding the two newly added categories (GE and IT), GE was observed in many universities, but only a few presented IT. This result may indicated that many medical schools need to review their graduation competencies in the future. In addition, various methods were used to implement graduation competency questionnaires. The number of Likert-type scales varied across universities (mainly four–six response anchors). One university even asked about the acquisition of graduation competencies by asking "Which competencies did you feel you have developed the most?" To address these issues, we converted the results of graduation competency questionnaires from numbers to rank to unify data. This method enables the comparison of the acquisition of graduation competencies in Japan, albeit forcibly.

To check for the presence of a national trend, a nonparametric multiple comparison of the rankings of the graduation competencies revealed a significant bias in categories. This finding indicates that medical schools differ in the difficulty of acquiring each category, which may be related to the gravity and difficulty of the curriculum that addresses the competencies. Although each competency is considered equally important in clinical practice, the difficulty of mastering each item lacks clarity.

In the post-hoc analysis, PR, CM, and LL ranked significantly better than GE, SO, and RE,

which suggests that mastering the former in medical school is easy. PR, CM, and LL are generally considered to represent general competence as members of society, while GE, SO, and RE are considered to require advanced competencies as medical professionals [16,17].

Finally, as a practical case, we compared the graduation competency questionnaires administered at our university with the others. The results generally displayed no remarkable differences, but, given the two rank differences for PR and GE, this result may suggest that the curriculum for mastering these categories is incomplete. Thus, data that could only be compared within universities can now be compared with national averages, which makes identifying the strengths and weaknesses of the acquisition of graduation competencies at one's university possible. Our university is currently implementing evaluation and feedback on unprofessional behavior in PR and curriculum improvement on general medicine in GE.

The limitations of this study include the possibility that omissions may have occurred in the method for the disclosure of data on graduation competencies across universities, the incompleteness of the work to classify them according to the Basic Qualities and Abilities Required of Physicians/Dentists," and the forced unification method of ranking data, which is statistically inaccurate. In addition, attention to the diversity of definitions and survey methods of graduate competencies across university is lacking.

In the future, after enhancing the research method, such as devising search keywords, we intend to standardize and compare the self- and peer assessments of graduation competencies after graduation. In addition, we aim to analyze the relationship between the acquisition of competencies at graduation and other indicators such as passing rates in national medical examinations.

5 Conclusions

By converting the data on graduation competency questionnaires into KPIs based on the Model Core Curriculum for Medical Education, the study observed differences in the acquisition of graduation competencies across universities. Furthermore, the results implied comparing the data from other universities with one's university could lead to better quality assurance.

Acknowledgments

A part of this work was supported by JSPS KAKENHI Grant Number JP 23K02523.

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