Developing the Comprehensive Medical Professionalism Assessment Scale

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Abstract

Background: There has been an increasing number of articles that have studied the topic of medical professionalism. The aims of this study were to develop a scale of medical professionalism.

Methods: The concepts of medical professionalism as defined by associations and groups of physicians, nurses and physiotherapists were investigated. The surveys using self-administered questionnaires were conducted on students and junior residents. An exploratory factor analysis, calculation of the coefficient alpha, and correlation coefficients with other scales were performed.

Results: A factor analysis resulted in the extraction of 30 items in 7 factors as items of the Level 1 scale for pre-clinical level students. The correlation coefficients between the scores for the 7 factors and KiSS-18 were in the range of 0.23 - 0.76. The coefficient alpha of all 30 items was 0.90. A factor analysis resulted in the extraction of 31 items in 8 factors from the Level 2 scale for students at the time of graduation. The correlation coefficient between the scores for the 8 factor and "Reflective skills" of the P-MEX was 0.31 - 0.59. The coefficient alpha for all 30 items was 0.93.

Conclusion: Construct validity, criterion-related validity and reliability were generally confirmed for the two scales.

Keywords: professionalism; assessment scale; factor analysis; questionnaire survey; validity; reliability

Introduction

There have been an increasing number of studies on medical professionalism since the 1990s (Smith, 2005).
Traditionally, professionals such as physicians and attorneys were considered professionals based on the social processes through which the professions were established. However, it has been criticised that physicians are not sufficiently fulfilling the social contracts (Hafferty, 2009), and physicians are consequently expected to cultivate higher levels of professionalism.

There are some definitions of professionalism. Stern and Arnold (Stern, 2006) stated that "professionalism is demonstrated through a foundation of clinical competence, communication skills, and ethical and legal understanding, upon which is built the aspiration to and wise application of the principles of professionalism". The Medical Professionalism Project also defined three fundamental principles and ten professional responsibilities of professionalism as the Physician Charter (ABIMFoundation et al., 2002). A comparison between the concepts of professionalism by Arnold and Stern (Stern, 2006) and the Physician Charter (ABIMFoundation et al., 2002) results in many common and divergent aspects. Therefore, the development and assessment of programmes that foster medical professionalism first requires defining medical professionalism and then measuring it.

The most commonly used instrument to measure professionalism is that created by Arnold et al. (Arnold et al., 1998) based on the definitions of professionalism given by the American Board of Internal Medicine (ABIM) in 1995, and several studies that revised and used this instrument. However, the results of factor analysis showed that there were some items with higher factor loading among several factors, and a reliability assessment showed that some subscale items had a coefficient alpha of less than 0.6. As Arnold et al. (Arnold et al., 1998) suggested the necessity of adding questionnaire items, this scale lacks reliability and validity.

The concept of professionalism has changed over time, from how the ABIM defined the concept of professionalism in 1995 to that published in the Physician Charter in 2002. The original six elements of professionalism presented in 1995 are no longer adequate for describing the concept of professionalism. Many other scales and instruments for measuring and evaluating professionalism of physicians have been developed, but there are many that have not been tested for construct validity.

This study seeks to develop a medical professionalism assessment scale for evaluating how medical professionalism is taught and fostered in students. Of the presumed steps to acquire medical professionalism, this study defines the stage before starting clinical practice as Level 1 and the stage at the time of graduation as Level 2, and develops two scales matched to the students' level of readiness. Development of these scales will contribute to objective evaluation of the outcomes of education in medical professionalism.

**Methods**

The following procedures were undertaken for developing an assessment scale of medical professionalism. First, the concepts of medical professionalism is extracted. Second, an item pool will be created based on the concepts extracted as a source for the scale items. Third, a pre-test will be conducted to develop the Level 1 scale for assessment readiness in pre-clinical students. Fourth, the main survey for developing the Level 1 scale for assessment of readiness in pre-clinical students will be conducted. Fifth, the Level 2 scale adapted for assessing the readiness of students at the time of graduation will be developed.

*Step 1: Extracting the concepts of medical professionalism*

A close investigation was performed on various documents (Table 1) describing medical professionalism of
physicians, nurses and physiotherapists as presented or published by associations of each profession in the four countries of Japan, the United States, United Kingdom and Canada. Content corresponding to medical professionalism were coded and abstraction and specification of concepts were repeated until 90 codes in 21 categories, 7 areas and 3 fields on the concept of medical professionalism were extracted (Table 2).

**Table 1. References for constructing of the concept of medical professionalism**

| No. | Profession | Name                                                                 | Person or Group, Nation                                                                 | Year of publication |
|-----|------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------|---------------------|
| 1   | Doctor     | Medical professionalism in the new millennium: a physician charter    | ABIM: American Board of Internal Medicine, .ACP-ASIM: American College of Physicians-American Society of Internal Medicine, EFIM: European Federation of Internal Medicine | 2002                |
| 2   | Doctor     | Good medical practice                                                | General Medical Council, U. K.                                                          | 2013                |
| 3   | Doctor     | CanMEDS 2015 physician competency framework                          | The Royal College of Physicians and Surgeons of Canada, Canada                         | 2015                |
| 4   | Doctor     | Professional ethics guidelines of the doctor                         | Japan Medical Association (Japan)                                                      | 2008                |
| 5   | Doctor     | A draft proposal of goals for professionalism                       | Japan Society for Medical Education, Japan                                             | 2015                |
| 6   | Doctor     | International code of medical ethics                                 | World Medical Association                                                              | 2006                |
| 7   | Doctor     | Measuring Medical Professionalism                                    | Stern, D. T. Arnold, L.                                                                | 2005                |
| 8   | Nurse      | The ICN code of ethics for nurses                                    | ICN: International Council of Nurses                                                  | 2012                |
| 9   | Nurse      | The ANA nursing code of ethics                                        | ANA: American Nurses Association, U. S.                                                | 2015                |
| 10  | Nurse      | The code of ethics for nurses                                        | Japan Nursing Association, Japan                                                       | 2003                |
| 11  | Nurse      | A model for professionalism                                          | Miller, B. K                                                                           | 1988                |
| 12  | Physical therapist | Professionalism: Physical therapy core values                     | APTA: American Physical Therapy Association, U. S.                                     | 2012                |
| 13  | Occupational therapist | Code of professional values and behaviour | CSP: Chartered Society of Physiotherapy, U. K.                                         | 2011                |

**Table 2. Medical professionalism concepts extracted from various products**

| Area                                           | Field                                           | Category                                      |
|------------------------------------------------|------------------------------------------------|-----------------------------------------------|
| Personality development, knowledge and skills as the basis for medical professionalism(1) | Personality development and social skills(11) | Character, integrity, empathy(11a)            |
|                                                |                                                 | Self-management (11b)                         |
|                                                |                                                 | Communication skills (11c)                    |
|                                                |                                                 | Continued education and career development (11d) |
|                                                |                                                 | Reflective practice (11e)                     |
|                                                | Practice based on high skill levels and knowledge (12) | Practice based on high skills and knowledge (12a) |
|                                                |                                                 | Establishing autonomy (13a)                   |
| Interactions between the patient, the medical profession and other health professionals (2) | Patient-centred care (21) | Patient-centred approach (21a) |
|---|---|---|
| | | Supporting patient autonomy (21b) |
| | | Understanding and interacting with the patient as a whole person (21c) |
| Collaborative practice (22) | Collaboration with professionals in other fields (22a) |
| | Collaboration within the medical/healthcare profession (22b) |
| Building an organizational environment for care (23) | Preparing the organizational environment for care (23a) |
| | Providing and promoting safe medical care (23b) |
| Fulfil social responsibilities (3) | Contributing to the community, professional associations and society (31) |
| | Affiliation and contributions to professional medical/healthcare associations (31a) |
| | Understanding of and contribution to public health activities in the community (31b) |
| | Contributing to health policies (31c) |
| | Use of mass media and information provision (31d) |
| | Understand the general legal and ethical principles to fulfil social responsibilities (32) |
| | Respect legal and ethical principles (32a) |
| | Appropriate handling and protection of personal information (32b) |
| | Fulfilling social responsibilities (32c) |

Concept identification numbers in parentheses. Ninety "code" subordinated to the "category" are omitted due to the lack of space.

**Step 2: Investigating the concepts of medical professionalism and creating an item pool**

Based on the concepts of medical professionalism, a working group of seven individuals, including the author made a close investigation of the draft items and created an item pool composed of 259 items.

**Step 3: Developing the Level 1 Scale: Pre-test**

*Study design:* A cross-sectional study with a collective survey using anonymous, self-administered questionnaires were conducted in April – June 2016.

*Subjects:* Subjects were first-year students of two universities located in Hokkaido, the northernmost part of Japan. The survey was conducted on 714 first-year students in eight departments (pharmacy, dentistry, nursing, clinical social welfare, clinical psychology, physical therapy, occupational therapy, speech-language-hearing therapy and dental hygiene) of University A, and 110 first-year students of the department of medicine of University B.

*Survey items:* As demographic characteristics, students’ academic faculty and department, year, and gender were surveyed. Thirty-five items were selected from the item pool as items to assess medical professionalism. The response options were as follows: Agree’ (5 points), ‘Agree to a certain extent’ (4 points), ‘Neither’ (3 points), ‘Disagree to a certain extent’ (2 points), and ‘Disagree’ (1 point).

*Analysis:* Exploratory factor analysis was performed to confirm the factor structure of the concepts of medical professionalism. The method for factor extraction consisted of the principal factor method using the promax
rotation. The Kaiser-Meyer-Olkin (KMO) test and the Bartlett's test of sphericity were used to examine the appropriateness of factor analysis. A result of the former of ≥0.8 and the latter of p<0.05 was considered to define appropriateness.

**Step 4: Developing the Level 1 Scale: Main Survey**

**Study design:** A cross-sectional study by collective survey using an anonymous, self-administered questionnaire was conducted in September 2016.

**Subjects:** 131 fourth-year students in the medical department and 40 students in the department of pharmacy of University C located near Tokyo.

**Survey items:** As demographic characteristics, students’ academic faculty and department, year, and gender were surveyed. Twelve items were excluded from 35 items used in pre-test, and 12 items were newly added from the item pool, so that 35 items were used in the main survey.

The KiSS-18 is an 18-item scale for measuring social skills in young adults developed in Japan with confirmed reliability and validity (Kikuchi, 2004; Niitsuma et al., 2012). The KiSS-18 evaluates skills in communication and developing personal relationships, and is used to assess criterion-related validity of the present medical professionalism scale. Each question on the KiSS-18 can be answered according to a following five-point Likert scale.

**Analysis:** Exploratory factor analysis was performed basically the same as that of pre-test. The Pearson correlation coefficient between the KiSS-18 and total score for items that compose the factors were calculated to assess criterion-related validity of the scale. As the KiSS-18 scale assess and measures social skills, the correlations with the medical professionalism scale were as follows: Moderate correlation (0.5) or above was expected with subscale items related to communication skills and interpersonal skills, whereas a mild positive correlation (0.3 or greater but less than 0.5) was expected with other subscale items.

The Cronbach’s coefficient alpha for each subscale item and all items were calculated to assess reliability of the scale.

**Step 5: Developing the Level 2 scale**

**Study design:** A cross-sectional study of a collective survey using anonymous, self-administered questionnaires was conducted in March – September 2016.

**Subjects:** Subjects were 352 junior residents immediately before starting their residencies in 35 postgraduate education hospitals affiliated with University B (i.e., immediately after graduation), and 83 fourth-year students in the nursing department of University C. Questionnaires were either collected and mailed back by the person in charge, or were mailed by individual residents.

**Survey items:** Gender was surveyed as a demographic characteristic. Level 2 items of the medical professionalism assessment scale were selected among the item pool. Fifty items were selected. Twenty-two of the 50 items were re-selected among items used in the Level 1 scale.
The Japanese version of the P-MEX (Professionalism Mini-Evaluation Exercise) (Tsugawa et al., 2011; Tsugawa et al., 2009), often used as a scale to assess professionalism in residents, were used to test criterion-related validity with the Level 2 scale. The P-MEX is composed of 4 factors and 24 items, among which the second factor, "Reflective skills" (5 items) was used as skills assumed to be largely acquired at the time of graduation. The P-MEX is used to assess others, not for self-assessment, the options for answers were revised to five-point Likert scale.

**Analysis:** The same methods as those used to for the main survey for the development for the Level 1 scale were used.

SPSS Statistics 22.0 (IBM) was used for the analysis of both surveys, and p<0.05 was set statistically significant.

**Ethical considerations**

Anonymous, self-administered questionnaires were used for the survey. Subjects were explained orally and in writing of the purpose, methods, ethical considerations and publication of the study results, and the survey was conducted on those who gave consent. Subjects were clearly explained the ethical considerations, including the following: (1) Data that allow identification of individuals would be deleted before use in analysis; (2) Subjects would not be subjected to losses or disadvantages regardless of their decision to cooperate or not cooperate in the study.

This study was approved by the Ethical Board of the Sapporo Medical University (27-2-58).

**Results**

**Level 1 Scale: Pre-test**

The response rate was 97.5% (803/824). Respondents were represented in largest numbers of the departments of pharmacy, nursing, medicine, physical therapy and dentistry, in that order. There were more female respondents (60.4%) than males (Table 3).

An exploratory factor analysis was performed to test construct validity. Eleven items that did not meet the criteria presented in the methods chapter were excluded from the factor analysis, and 5 factors composed of 24 items were extracted.

**Table 3. Demographic characteristics of respondents**

| Research Variable | Category | n   | %   | Mean,SD |
|-------------------|----------|-----|-----|---------|

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Level 1: Pre-test (n=803)

| Disipline                              | Pharmacy | 169 | 21.0 |
|----------------------------------------|----------|-----|------|
| Nursing                                | 114      | 14.2|
| Medicine                               | 101      | 12.6|
| Physical therapy                       | 85       | 10.6|
| Dentistry                              | 83       | 10.3|
| Clinical psychology                    | 67       | 8.3 |
| Speech-language-hearing therapy        | 66       | 8.2 |
| Occupational therapy                   | 43       | 5.4 |
| Clinical social work                   | 41       | 5.1 |
| Dental hygiene                         | 34       | 4.2 |
| Gender                                 | Male     | 318 | 39.6|
|                                        | Female   | 485 | 60.4|

Level 1: Main survey (n=144)

| Disipline                              | Medicine | 105 | 72.9|
|----------------------------------------|----------|-----|------|
| Pharmacy                               | 39       | 27.1|
| Gender                                 | Male     | 84  | 58.3|
|                                        | Female   | 60  | 41.7|
| KiSS-18                                | 143      | 62.65±10.44|

Level 2: Main survey (n=237)

| Disipline                              | Medical intern | 163 | 68.8|
|----------------------------------------|-----------------|-----|------|
| Nursing                                | 74              | 31.2|
| Gender                                 | Male            | 114 | 48.3|
|                                        | Female          | 122 | 51.7|
| P-MEX                                  | Reflective skills | 233 | 15.33±2.12|

**Level 1 Scale: Main survey**

The response rate was 90.6% (155/171). There were slightly more male (58.3%) than females (41.7%) (Table 3). The mean KiSS-18 score ± standard deviation was 62.65±10.44. There are studies that have assessed university students in medical domains to score around 60 points (Fujino et al. 2005; Kudou et al. 2007; Yamamoto et al. 2013), the social skills of the subjects of analysis can be estimated to be largely standard.

Thirty items in 7 factors were extracted by factor analysis (Table 4). The KMO statistic was 0.839 and the Bartlett's test of sphericity was significant (p<0.001, $\chi^2=1384.8$, df=435), demonstrating the appropriateness of the results of the factor analysis. The 7 factors were named as follows: "Building interpersonal relationships" (Factor 1), "Planned learning" (Factor 2), "Interest in community health" (Factor 3), "Reflective practice" (Factor 4), "Knowledge and skills" (Factor 5), "Ethical and social responsibility" (Factor 6) and "Self-management" (Factor 7).
Table 5. Pearson's correlation coefficients between the sub-scale of Level 1 medical professional evaluation scale and KiSS-18, and Cronbach's alpha coefficients

| Sub-scale | 0.71*** | 0.76*** | 0.90 | 0.46*** | 0.84 |
|-----------|---------|---------|------|----------|------|
| Total score: 30 items | 0.43*** | 0.23** | 0.44*** | 0.52*** | 0.04 |

Cronbach's alpha

The coefficient of the 7 factors was 0.63-0.86, and the coefficient alpha for all 30 items was 0.90.

The Pearson product-moment correlation coefficient between the scores for the 7 factors and the KiSS-18 was 0.23-0.76. The correlation was strongest with Factor 1, "Building interpersonal relationships" (r=0.76) and Factor 3, "Ethical and social responsibility" (Factor 6) and Factor 7, "Self-management" (Factor 7).

** p<0.01, ***p<0.001
The response rate was 55.2% (240/435). There were slightly more females (51.7%) compared to males (48.3%) (Table 3). The score distribution of "Reflective skills" of the P-MEX was 15.33±2.12.

Thirty-one items from 8 factors were extracted by factor analysis (Table 6). The KMO statistic was 0.886 and the Bartlett's test of sphericity was significant (p<0.001, χ²=3794.1, df=465); thus, it demonstrated the appropriateness of the factor analysis results. The 8 factors were named as follows: "Providing safe, quality care" (Factor 1), "Providing patient-centred care" (Factor 2), "Planned learning" (Factor 3), "Collaborative practice" (Factor 4), "Building interpersonal relationships" (Factor 5), "Interest in community health" (Factor 6), "Ethical and social responsibility" (Factor 7) and "Reflective practice" (Factor 8).

There was a moderate correlation between "Reflective skills," Factor 2 of the P-MEX and the Level 2 medical professionalism assessment scale, at 0.28-0.59 (Table 7). The correlation coefficient with Factor 8, "Reflective practice" for which the details of the assessment items are similar, was particularly high at 0.59.

The coefficient alpha of the Level 2 scale was in the range of 0.71 to 0.87, and the α coefficient for all 31 items was 0.93.

**Table 6. Results of factor analysis of the level 2 medical professional evaluation scale**

| ID | Category | Item                                                                 | Factor loadings |
|----|----------|----------------------------------------------------------------------|-----------------|
| 101| 21a      | I can plan treatment and care strategies considering the patient's quality of life. | 0.965 0.080 0.028 -0.004 -0.031 -0.008 -0.012 -0.205 |
| 102| 12a      | I understand the basic principles of safety management in providing treatment and care. | 0.846 -0.237 -0.090 0.045 0.158 0.073 0.139 0.017 |
| 103| 12a      | I know the standard treatments and care methods for common diseases. | 0.760 -0.256 0.122 0.000 0.031 -0.068 -0.066 0.167 |
| 104| 21a      | I can explain things to patients accurately in a way that is easy to understand. | 0.573 0.283 -0.047 -0.165 -0.008 0.021 -0.125 0.209 |
| 105| 21b      | I can provide the necessary information required by patients for decision making. | 0.535 0.318 0.006 0.029 -0.119 0.062 -0.146 0.064 |
| 106| 21a      | I understand the intent and purpose of a second opinion. | 0.434 0.292 0.055 -0.017 -0.047 0.063 0.099 -0.170 |
| 107| 21c      | I do my best to gain a deep understanding of the patient's values and background to determine his/her lifestyle. | -0.149 0.868 0.050 -0.036 0.069 0.035 -0.032 -0.062 |
| 108| 21c      | I try to predict patients' feelings or thoughts while interacting with them. | -0.125 0.733 -0.165 0.072 0.208 0.029 0.070 0.031 |
| 109| 21a      | I make efforts to build a relationship of trust with patients. | 0.253 0.678 -0.115 -0.129 0.124 -0.115 0.171 -0.056 |
| 110| 21b      | I can interact with patients to encourage them to learn or acquire knowledge on their own. | 0.073 0.530 0.136 0.156 -0.159 0.096 -0.106 0.063 |
|   |   | I have the habit of studying daily whether or not there is a major or minor examination coming up. | -0.026  | -0.034  | **0.832** | -0.013  | 0.037  | 0.026  | -0.033  | -0.034  |
|---|---|---|---|---|---|---|---|---|---|---|
| 13 | 11d | I can create a study plan and follow it. | -0.056  | -0.173  | **0.703** | -0.121  | 0.125  | 0.171  | 0.016  | 0.204  |
| 12 | 11d | I always arrive on time and am prepared to learn at lectures, seminars, or internships. | 0.218  | 0.042  | **0.544** | 0.074  | -0.017  | -0.068  | 0.101  | -0.092  |
| 28 | 11b | I have an accurate grasp of my daily schedule. | 0.101  | 0.172  | **0.423** | 0.130  | -0.005  | -0.043  | 0.075  | -0.083  |
| 30 | 11b | I have built a relationship of mutual aid and cooperation with colleagues within my profession. | -0.023  | -0.078  | **-0.110** | **0.870** | 0.139  | -0.036  | 0.116  | -0.109  |
| 111 | 22b | I can discuss the state of treatment and care with colleagues in the same profession with both more or equal amount of experience as myself. | 0.055  | -0.048  | 0.005  | **0.833** | -0.127  | 0.047  | -0.045  | 0.062  |
| 112 | 22b | I want to actively participate in the guidance or education of my juniors. | -0.081  | 0.081  | 0.177  | **0.526** | 0.136  | -0.146  | -0.067  | -0.117  |
| 113 | 22b | I understand the knowledge, skills, and specializations of other professionals to consult them appropriately. | 0.102  | 0.052  | -0.052  | **0.509** | -0.095  | 0.183  | -0.016  | 0.139  |
| 8 | 11c | I can "break the ice" easily and speak frankly with people who I meet for the first time. | 0.034  | 0.007  | 0.108  | **-0.039** | **0.740** | 0.058  | 0.024  | -0.067  |
| 1 | 11c | I can continue a conversation while paying attention to the other person's responses. | -0.006  | 0.293  | -0.136  | 0.058  | **0.574** | 0.074  | -0.056  | 0.076  |
| 115 | 31a | I can describe my specialization or activities to a layperson. | 0.029  | 0.179  | 0.193  | 0.194  | **0.504** | -0.168  | -0.057  | 0.021  |
| 116 | 31b | I have knowledge on the medical or public health activities and welfare services being offered in accordance with the characteristics of the community. | 0.030  | -0.027  | 0.043  | -0.010  | -0.011  | **0.886** | 0.008  | -0.069  |
| 117 | 31b | I know the functions and roles of professionals working in public health, medical, and welfare facilities other than hospitals. | 0.042  | 0.039  | 0.069  | -0.097  | 0.037  | **0.810** | 0.143  | -0.066  |
| 118 | 31a | I will not misuse my title as a medical professional for personal gain (e.g., goods offered by pharmaceutical companies). | 0.119  | -0.119  | -0.092  | 0.110  | 0.012  | -0.052  | **0.756** | 0.156  |
| 119 | 32c | I can firmly refuse monetary gifts or any other gift from patients. | -0.069  | 0.015  | 0.113  | 0.126  | -0.026  | 0.106  | **0.639** | -0.033  |
| 120 | 32c | I do not disclose information that I could obtain through internships and other means to family or friends. | -0.103  | 0.210  | 0.045  | -0.198  | -0.014  | 0.124  | **0.539** | 0.019  |
| 121 | 32b | I can accurately estimate my current capacity and limits. | 0.047  | -0.132  | -0.069  | -0.070  | 0.106  | 0.039  | -0.071  | **0.804** |
| 20 | 11e | I am open to criticism or assessment by others. | -0.062  | 0.034  | 0.053  | -0.031  | -0.116  | -0.123  | 0.176  | **0.641** |
I report or can report my mistakes or errors to my instructor without hiding them.

I can look back on my mistakes to analyze their cause and benefit from them in future.

The numbers less than 100 are the items used in common by Level 1 and Level 2 scale. The numbers 100 more than 100 are the items used in only Level 2 scale.

The 8 factors were named as follows: "Providing safe, quality care" (Factor 1), "Providing patient-centred care" (Factor 2), "Planned learning" (Factor 3), "Collaborative practice" (Factor 4), "Building interpersonal relationships" (Factor 5), "Interest in community health" (Factor 6), "Ethical and social responsibility" (Factor 7) and "Reflective practice" (Factor 8).

### Table 7. Pearson's correlation coefficients between the sub-scale of Level2 medical professional evaluation scale and P-MEX, and Cronbach's alpha coefficients

| Sub-scale                              | Correlation coefficient with Reflective skills of P-MEX | Cronbach's alpha |
|----------------------------------------|--------------------------------------------------------|------------------|
| Factor 1: Providing safe, quality care | 0.37 ***                                                | 0.87             |
| Factor 2: Providing patient-centred care | 0.47 ***                                               | 0.82             |
| Factor 3: Planned learning             | 0.28 ***                                                | 0.78             |
| Factor 4: Collaborative practice       | 0.41 ***                                                | 0.78             |
| Factor 5: Building interpersonal relationships | 0.32 ***                                             | 0.77             |
| Factor 6: Interest in community health | 0.36 ***                                                | 0.83             |
| Factor 7: Ethical and social responsibility | 0.31 ***                                              | 0.71             |
| Factor 8: Reflective practice          | 0.59 ***                                                | 0.72             |
| Total score: 30 items                  | 0.53 ***                                                | 0.93             |

** p<0.01, ***p<0.001

### Discussion

**Construct validity of the medical professionalism assessment scale**

A factor analysis resulted in the extraction of 30 items in 7 factors from the Level 1 scale and of 31 items in 8 factors of the Level 2 scale. The results of Kaiser–Meyer–Olkin test and Bartlett's test of sphericity were good overall.

We will attempt to compare the concepts that compose the ABIM scale(Arnold et al., 1998) and the P-MEX scale(Cruess et al., 2006) to investigate the construct validity of the Level 2 scale. The ABIM scale is composed of the 3 factors of "Altruism," "Respect for others," "Excellence" and "Honour and Integrity." The details of "altruism" and "respect for others" are related to patient-centred care and collaboration with professionals in other healthcare professionals. They correspond to the 2nd factor "Providing patient-centred care" and the 4th factor "Collaborative practice" of our Level 2 scale. "Excellence" also corresponds to the 2nd factor "Providing patient-centred care" and...
the 4th factor "Collaborative practice." "Honour and integrity" corresponds to the 2nd, 7th and 8th factors, which are respectively, "Providing patient-centred care," "Ethical and social responsibility" and "Reflective practice."

The P-MEX(Cruess et al., 2006) has 24 items in the 4 factors of "Doctor-patient relationship skills," "Reflective skills," "Time management" and "Interprofessional relationship skills." Comparing this to Level 2 scales in this study, "Doctor-patient relationship skills" correspond to "Providing patient-centred care" (Factor 2), "Reflective skills" corresponds to "Reflective practice" (Factor 8), "Time management" corresponds to "planned learning" (Factor 3) and "Interprofessional relationship skills" corresponds to "Collaborative practice" and "Building interpersonal relationships" (Factors 4 and 5). As such, the components of the ABIM and P-MEX scales are encompassed by the Level 2 scale of this study, and were also found to be consistent with the concepts of medical professionalism displayed in Table 2. These observations demonstrate that the Level 2 scale is a scale that can comprehensively assess medical professionalism.

Our Level 2 scale contains the concepts of "Providing safe, quality care" (Factor 1) and "Interest in community health" (Factor 6) which are not included in the ABIM and P-MEX scales. Perhaps there is some debate as to whether Factor 6, "Interest in community health," is an element of professionalism that all healthcare professionals should have. However, in recent years, days in hospital are being cut dramatically in acute care hospitals especially in Japan, and with this change, healthcare professionals in acute care are also required to adjust the treatment and care they give to one with consideration for the patient's life and environment following discharge. This suggests that it is very important for "Interest in community health" to be included in the scale for measuring medical professionalism. As such, the Level 2 scale of this study regards the concepts of medical professional more broadly and comprehensively than existing scales of medical professionalism, and is a novel scale that is well adapted to change in the healthcare environment.

On the other hand, for the characteristics of the Level 1 scale 18 items in the field "Personality development and social skills (Category: 11a, 11b, 11c, 11d)" have been selected, which suggests the importance of cultivating professionalism in this field among students before they start their clinical practice. There are no scale items that correspond to the field "Patient-centred care(Category: 21a, 21b, 21c)" in the Level 1 scale, but there are 9 items in the Level 2 scale, which illustrates that this is an aspect of professionalism that is fostered in clinical practice. As such, the scales at the two levels are adapted to the readiness of students, as the Level 1 scale measures professionalism of students before clinical practice and the Level 2 scale measures medical professionalism at graduation.

**The criterion-related validity of the medical professionalism assessment scale**

To investigate the criterion-related validity of our medical professionalism assessment tools, we examined the correlation between the Level 1 scale and the KiSS-18, which measures social skills. The correlation was the strongest (r=0.76) with the 1st factor, "Building interpersonal relationships," which is the most similar to the details of the KiSS-18, suggesting that the respondents were reacting and answering appropriately to the items and thereby securing criterion-related validity.

We examined the correlation between eight Level 2 subscale items and "Reflective Skills" of the P-MEX. The correlation was the strongest (r=0.59) with the 8th factor of "Reflective practice". This also suggested that the respondents were reacting appropriately to the items, thereby again securing criterion-related validity.

**Reliability of the medical professionalism assessment scale**
The reliability coefficient for the 8 subscales in the Level 2 scale lies in the range of 0.71–0.87, ensuring high reliability. The reliability coefficient $\alpha$ of seven subscales in the Level 1 scale was above 0.6 for all subscales, which indicates that a certain degree of reliability was ensured. However, it might be necessary to reinvestigate the possibility of revising some of the scale items as the reliability coefficient $\alpha$ of three subscale items was below 0.7.

**Limitations and future challenges in the medical professionalism assessment scale**

The first of the limitations and tasks of this scale, we are yet to verify the cross-cultural validity of the scales. Second, there is room for improvement in the Level 1 scale to increase reliability, and this may require reinvestigation with possible revision of the scale. Third, test-retest reliability should be examined. Forth, this is a self-assessment tool and does not directly measure the medical professionalism abilities acquired by students. The predictive validity should be examined by the longitudinal study.

**Conclusion**

We developed two medical professionalism assessment scales for students to self-evaluate the levels of medical professionalism that they have acquired. The scales were based on concepts of medical professionalism extracted from various materials on medical professionals published or presented by various professional associations. Factor analysis resulted in 30 items from 7 factors for Level 1 (before clinical practice) and 31 items from 8 factors for Level 2 (at the time of graduation) assessments. Construct validity, criterion-related validity and reliability were generally confirmed, and we will study these issues further to enable their use in evaluation of medical education.

**Take Home Messages**

- The concepts of medical professionalism are changing with changes in the healthcare environment.
- There are no existing assessment scales of medical professionalism with proven validity and reliability that can be applied for evaluating education.
- The two new assessment scales developed for medical professionalism can be used at two levels: before starting clinical practice (Level 1) and at the time of graduation (Level 2).
- The assessment scales warrant further investigations to examine applicability in other cultures and test-retest reliability.

**Notes On Contributors**

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Appendices
None.

**Declarations**

*The author has declared that there are no conflicts of interest.*

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**Ethics Statement**

This study was approved by the Ethical Board of the Sapporo Medical University. Reference (27-2-58).

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