

ORIGINAL RESEARCH: EMPIRICAL RESEARCH –
QUANTITATIVEQuality of nursing doctoral education in seven countries: survey of
faculty and students/graduates

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Abstract

Aims. This study aimed to compare the findings of the quality of nursing doctoral education survey across seven countries and discuss the strategic directions for improving quality.

Background. No comparative evaluation of global quality of nursing doctoral education has been reported to date despite the rapid increase in the number of nursing doctoral programmes.

Design. A descriptive, cross-country, comparative design was employed.

Methods. Data were collected from 2007–2010 from nursing schools in seven countries: Australia, Japan, Korea, South Africa, Thailand, UK and USA. An online questionnaire was used to evaluate quality of nursing doctoral education except for Japan, where a paper version was used. Korea and South Africa used e-mails quality of nursing doctoral education was evaluated using four domains: Programme, Faculty (referring to academic staff), Resource and Evaluation. Descriptive statistics, correlational and ordinal logistic regression were employed.

Results. A total of 105 deans/schools, 414 faculty and 1149 students/graduates participated. The perceptions of faculty and students/graduates about the quality of nursing doctoral education across the seven countries were mostly favourable on all four domains. The faculty domain score had the largest estimated coefficient for relative importance. As the overall quality level of doctoral education rose from fair to good, the resource domain showed an increased effect.

Conclusions. Both faculty and students/graduates groups rated the overall quality of nursing doctoral education favourably. The faculty domain had the greatest

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Introduction

There has been a rapid increase in the number of nursing doctoral education programmes in the world from 286 in 2005 to 333 in 2012 (Ketefian *et al.* 2005, International Network for Doctoral Education in Nursing (INDEN) 2012); yet quality has not been evaluated systematically across countries. At

importance for quality, followed by the programme domain. However, the importance of the resource domain gained significance as the overall quality of nursing doctoral education increased, indicating the needs for more attention to resources if the quality of nursing doctoral education is to improve.

Keywords: doctoral education, evaluation, faculty, global, nursing education, PhD, postgraduate study, quality, students/graduates

Why is this research needed?

- Although the number of nursing doctoral programmes has rapidly increased in recent decades, their quality has not been systematically evaluated.
- The quality of nursing doctoral education needed to be examined from a global perspective so as to identify those domains that drive quality improvement.

What are the key findings?

- Faculty and students/graduates from seven countries rated the overall quality of nursing doctoral education favourably, suggesting their satisfaction with their doctoral education.
- Faculty and programme domains were important strategic areas for upholding and improving the quality of nursing doctoral education.
- The resource domain became increasingly important as the quality level increased, indicating the central role that resources play in improving the quality of nursing doctoral programmes.

How should the findings be used to influence policy/practice/research/education?

- The findings should be used to develop educational policy that would strengthen the faculty and programme domains in nursing schools worldwide.
- The quality of nursing doctoral education questionnaire should be used as a standard instrument that would allow researchers to compare across countries.
- The findings should be used to develop strategies that would improve the quality of nursing doctoral education at a global level.

the individual country level, Japan's growth is notable, from one in 1966 to 73 in 2013 (Japan Nursing Association 2014).

Concerns have been expressed about programme quality. Recently, scholars in the supplement issue of the *Journal of Nursing Science* (2013) expressed apprehensions about the adequacy of faculty preparation, the quality of dissertations and nursing research in general and the adequacy of

programmes in Japan (Horiuchi 2013), Korea (Park *et al.* 2013) and Thailand (Tilokskulchai & Srisuphan 2013). Concerns were also raised about the quality of PhD education at a recent PhD summit sponsored by the American Association of Colleges of Nursing (AACN 2013b) and the Quality Assurance Agency for Higher Education in the UK (QAAHE 2011).

Faculty shortages and lack of resources have been associated with a lower quality of nursing doctoral education (Ketefian *et al.* 2005, Kim *et al.* 2010, Arimoto *et al.* 2012). Faculty refers to academic personnel/staff. This was also found in an investigation in South Africa. Concerns about doctoral education, its quality and access are not exclusively specific to the nursing profession. In the Organization for Economic Co-operation and Development (OECD) member countries, the annual number of doctorates awarded grew by nearly 40% in the decade ending 2008 (Greenhalsh 2013). In China alone, the number of PhDs awarded grows by around 40% each year. In 2013, the European University Association (EUA) produced its two-year Accountable Research Environments for Doctoral Education (ARDE) project (EUA 2013). It showed a lack of coherence among the different quality evaluations to which doctoral programmes were subjected. It concluded that there was no lack of evaluation of doctoral education, rather a lack of coordination and over-evaluation. Hence, this study was undertaken to examine the quality of nursing doctoral education in research-intensive/active nursing doctoral programmes (i.e. PhD or equivalent degree) in seven countries.

Background

The global increase in the number of nursing doctoral programmes requires sufficient qualified faculty members to meet the demand. However, the numbers of faculty and resources necessary for quality education have not kept pace with demand. The faculty vacancy rate in the U.S. was 7.6% (AACN 2012). In the UK, there is a trend of faculty being employed as teaching fellows on teaching-only contracts. This will undoubtedly have a negative impact on the availability of nursing faculty to mentor doctoral students and supervise their research (Sarchet 2013). In Thailand, there are no current data available on the faculty vacancy rate. However, in 2006, it was projected that, to comply with the student-faculty ratio as determined by the Thailand Nursing Council, there was a need to create 676 additional nursing faculty positions by 2010, particularly doctoral-prepared faculty (Nantsupawat *et al.* 2008). Anecdotally, nursing leaders do not believe the numbers were

reached. Likewise, Korea does not have faculty shortage data, but many new nursing schools are recruiting doctorally prepared faculty to meet the revised Nursing Education Accreditation Standards (Korean Accreditation Board of Nursing Education 2012). Similarly, overall faculty shortages and a lack of faculty with adequate preparation were reported in a paper by Horiuchi on Japan (2013). Hiring new doctoral graduates does not address the need; these are novices who require several years of mentored experience before they are able to function as effective scholars and supervisors in their own right.

The faculty shortage in the USA has been further compounded by the sharp increase over the last decade in practice-oriented doctorate programmes; there are 217 Doctor of Nursing Practice (DNP) programmes (AACN 2013a). Many PhD-prepared faculties teach in both PhD and DNP programmes – if their institution offers both types of degrees (Minnick *et al.* 2013). This is likely to increase the faculty member's teaching load. Hence, as reported by Miki *et al.* (2012), the potential exists for such faculty members to have less time to devote to mentoring and supervising the research of their PhD students. In addition, given the shorter duration of DNP study – 3 years – and other factors as well, there is the opportunity that potential students would be attracted to enter DNP rather than PhD programmes. It is encouraging to note that the National Research Foundation (NRF) in South Africa has declared that expertise in nursing science is a scarce skill and is investing millions of Rands to build capacity at the PhD level (Uys & Klopper, personal communication). On the other hand, David Willetts, the government minister previously in charge of university funding in the UK, complained that there was too much emphasis on research to the detriment of teaching and that the balance had to be adjusted (Parr 2013). The implications of this for doctoral education are obvious.

Additional concerns about the quality of doctoral education include the types of doctoral programme in which nurses tend to enrol. These include non-nursing fields such as health sciences or fields tangentially related to nursing. This may mean that non-nurses are taking the primary supervising role for nursing doctoral students, which may compromise research on nursing science and that these new scholars are not being socialized in nursing. A study by Kayama *et al.* (2013) showed that non-nurse supervisors felt unprepared for advising PhD students on qualitative research.

Attention needs to be paid to the opinions of current doctoral students, who emphasized the importance of research experiences to their satisfaction and to programme quality

(Wasburn-Moses 2008). The literature on evaluation of nursing doctoral programmes suggested that more systematic evaluations were necessary to enhance their quality (McKenna 2005). In particular, attention must be given to factors such as the curricula, competence of the faculty, research activities and student involvement in courses and research (Kjellgren *et al.* 2005). Similar findings were noted in our South African study.

The quality standards, criteria and indicators (QSCI) committee of the International Network for Doctoral Education in Nursing (INDEN) expanded the work of the AACN document to make it relevant and applicable to various models of doctoral education around the world (AACN 2001). The committee developed the global quality standards, criteria and indicators for doctoral programmes with the contribution of eight country representatives. The output of this committee was published (Kim *et al.* 2006) and appears in the INDEN website (http://nursing.jhu.edu/excellence/inden/documents/doctoral_quality_criteria_inden.pdf). Several authors of this paper participated in developing and testing the validity and reliability of the global QNDE questionnaire, using the QSCI as the foundation.

While nursing doctoral programmes worldwide have expanded, quality concerns have become accentuated due to inadequacy of resources and faculty, both in terms of numbers and their experiential quality to provide mentorship and guidance to students. In view of the realities described above, a team of interested investigators collaborated to conduct this study in seven countries; together, they constitute different types of educational systems, different healthcare systems, different economies and cultures, thus enhancing the diversity of the research team.

The study

Aims

This paper aims to fill a gap in the literature on the quality of nursing doctoral education across the globe. The specific aims of this study were to: (a) compare the findings across seven countries from the perspectives of deans, faculty and students/graduates in four domains; (b) discuss strategic directions for improving the quality of doctoral education from a global perspective.

Design

A descriptive, cross-country, comparative design was employed using an online survey; researchers in Japan used a paper-and-pencil method. Quality was evaluated in

doctoral programmes in the research-intensive/active universities (i.e. focused on research such as offering PhDs or its equivalent degree); and the evaluation was conducted by deans, faculty (i.e. providers of education) and students/graduates (i.e. recipients of education) in four domains: programme, faculty, resource and evaluation.

Participants

Participants were recruited from schools of nursing in seven countries: Australia, Japan, Korea, South Africa, Thailand, UK and USA. In the USA, recruitment was focused on institutions that received National Institutes of Health (NIH) funding during the years 2004–2007. Australia, Japan, South Africa and Thailand recruited all institutions with nursing PhD programmes, whereas the UK recruited 35 schools of nursing that had submitted to the Government's Research Assessment Exercise in 2008 (Higher Education Funding Council for England (HEFCE) 2008). This would suggest that they were research-active schools of nursing. Korea included 14 schools with PhD programmes that had graduates and were located in different geographical locations.

Data collection

Between 2007–2010, a combination of online and onsite data collection procedures was initiated across the seven participating countries. Each site was asked to use a centralized approach guided by the online data administrator at the University of Illinois at Chicago (UIC). The data administrator coordinated the collection and processing of all research data. He followed up with the liaison person in each school of nursing to ensure adherence to their institution's IRB protocol, to recruit faculty and students/graduates from their respective schools and to perform Web hosting. Institutions in all countries except for Japan employed the online survey tool. Korea and South Africa used the same online tool and the country investigators communicated via e-mails. All countries except Japan used the English version of the questionnaire. All participating countries recruited schools of nursing in a similar manner, using the centralized standard templates and procedures developed by the UIC-based Principal Investigator (PI).

Initial contact letters were sent to administrative heads (deans) of schools of nursing with research-focused doctoral programmes by the PIs in each of the seven countries. After consent was obtained and the deans designated a school liaison, the liaison contacted the faculty and students/graduates

via e-mail describing the nature of the research; they provided access to the survey instruments via the website and invited participation. At two-week intervals, the liaison at each school would follow-up with potential respondents to improve response rates. The data administrator and liaisons were in regular contact to coordinate their activities. Despite some minor variations in data collection procedures to fit the situation in each country, there was overall coherence across the seven-country settings.

Instrument

QNDE questionnaire for deans, faculty and students/graduates

The questionnaire (referred to in *italics* as *QNDE* to differentiate it from the generic concept QNDE) consisted of 43 items that examined the relationship between quality of nursing doctoral education and faculty-level scholarly performance. All countries used the same surveys, but some modified the tool to account for country-specific variations; however, the core content remained the same. Examples of modifications include degree requirements, coursework credit and research focus. Two online questionnaires were used: <http://gknf.or.kr/research/> for the Thailand and the US studies; and <http://qndesurvey.limequery.com/> for UK and Australia studies. The latter Internet survey (limequery) was developed to reflect the European education system and terminologies.

For deans, survey constructs included *inter alia* school characteristics, alignment of nursing doctoral education goals and strategies with parent institution, annual student enrolment, number of graduates and postgraduation employment. For faculty and students/graduates, the 43-item survey consisted of four domains: quality of programme/curriculum (17 items), faculty (12 items), resource (nine items) and evaluation (five items). Items for all four domains can be found in the study of Miki *et al.* (2012).

Sample constructs included among others, formal ethics training in research, faculty mentorship, value of research programmes and scholarship, library resources and programme evaluation. Items were rated on a 4-point scale (1 = strongly disagree to 4 = strongly agree). Faculty members with experience in doctoral education evaluated the appropriateness, feasibility and user-friendliness of the items. The online surveys were pilot-tested with several faculty members and PhD students/graduates before they were fully deployed. Feedback was used to strengthen the survey content, wording and clarity. The data administrator addressed suggestions about ease of administration and timeliness of accessing the survey website.

Validity and reliability/rigour

Given that this was the first time the QSCI-based instrument was used to evaluate the quality of nursing doctoral education at the global level, validity and reliability analyses were performed. Four professors from Korea and the US reviewed the instruments for content validity. The individuals had experience in nursing doctoral education and were recognized experts in their fields. Formative construct validity and reliability were confirmed with all statistically significant indicator weights for the four domains in Korea and US (Kim *et al.* 2012, 2014). Analysis of the Japanese *QNDE* survey protocols showed similar levels of validity and reliability (Arimoto *et al.* 2012, Miki *et al.* 2012, Nagata *et al.* 2012). These published studies support the validity and reliability of the questionnaire used in this study.

Statistical justification of individual-level QNDE domain score aggregation for the country-level QNDE questionnaire score

It was necessary to justify the use of country-level domain scores of the *QNDE* questionnaire to analyse the combined seven-country *QNDE* questionnaire data. Therefore, within-group agreement analysis was applied and Rwg (within-group agreement) and intra-class cluster correlation (ICC) (1) and ICC (2) were calculated (James *et al.* 1984, Hofmann 2008). Median Rwg values for the four domains (programme, faculty, resource and evaluation) were 0.869, 0.867, 0.857 and 0.845, respectively, exceeding the recommended cut-off of 0.70 (James *et al.* 1984). These results indicated adequate agreement among *QNDE* survey responses. The average ICC (1) values for the programme, faculty, resource and evaluation domains were 0.214, 0.066, 0.137 and 0.250, respectively. Except for the faculty domain, all were much higher than the cutoff value of 0.12 (James 1982). The average ICC (2) values for the programme, faculty, resource and evaluation were 0.983, 0.937, 0.970 and 0.978, respectively. Because these values were above the recommended cut-off points (Schneider *et al.* 1998), the individual-level domain scores could be aggregated for a country-level *QNDE* questionnaire score.

Ethical considerations

This study was approved by the Institutional Review Boards of the University of Illinois at Chicago (2006-0604), which was applicable to the Australia, Korea, Thailand, UK and U.S. studies; the University of Tokyo (2008-2303); and

the North-West University (NWU-0085-08-S5) received additional IRB approvals. The voluntary participation of deans, faculty and students/graduates in the survey was considered as their consent.

Data analysis

The statistical analyses were done with IBM SPSS Statistics software, v.18.0 (SPSS, IBM, Armonk, NY, USA) and Stata 12 (Stata Statistical Software: Release 12, 2011; Stata Corp, College Station, TX, USA). The researcher who conducted the data analysis was blinded to each and all participants. Descriptive statistics, correlational and ordinal logistic regression were applied to compare the four domain scores of the *QNDE* questionnaire across the seven countries. Direct comparisons of the four domain scores alone may not be sufficient to determine the priority for improving the quality of nursing doctoral education unless it is assumed that all four domains have equal importance. Therefore, the domain importance attributed to the overall quality of nursing doctoral education was estimated using ordinal logistic regression. Generalized ordinal logistic regression was used to estimate the importance levels of each domain at different levels of quality (e.g. fair to good to excellent) of nursing doctoral education (Williams 2006).

Results

Demographical characteristics

A total of 105 deans/schools, 414 faculty and 1149 students/graduates responded to the questionnaire across the

seven countries. The number of schools that participated from each country was: Australia (7), Japan (28), Korea (14), South Africa (15), Thailand (7), UK (5) and U.S. (29). The type of doctoral programme were categorized according to whether coursework was included or excluded in the curriculum. Table 1 shows by the seven countries the types of programmes and the response rates of participating schools of nursing. Response rates of participant schools from the pool of schools in 2008 (when most data were collected) varied widely among the seven countries (i.e. 10–100%). Response rates of faculty vs. students/graduates cannot be presented, as total numbers were not available. Data for the total number of schools of nursing offering PhDs in the seven countries are from 2011 (most recent available data). There were no statistically significant differences in overall quality of nursing doctoral programmes between those with and without coursework.

Faculty and students/graduates' perceptions

The perceptions of faculty and students/graduates of the quality of nursing doctoral education in the seven countries were mostly favourable in all four domains of the *QNDE* questionnaire (Table 2). Responses of students and graduates were combined because no significant differences were found between the two groups in the majority of countries and one country did not report the responses separately. Among the seven countries, in general, faculty rated the quality higher than students/graduates in three domains (programme, faculty and evaluation). However, previous studies reported that in Korea and the UK, the faculty rated the programme, faculty and resource more positively than

Table 1 Type of doctoral education, number of doctoral programmes and response rates of participating doctoral programmes in seven countries.

Country	Type of doctoral programme		Total no of SON with PhD programme (2011)*	No. of SON asked to participate (2008)†	No. (%) of SON responded	No. of faculty	No. of students/graduates
	Research only	Research & coursework					
Australia	√		34	34	7 (21)	13	33
Japan		√	65	46	28 (61)	85	151
Korea		√	22	14	14 (100)	48	139
South Africa	√		16	16	15 (94)	26	87
Thailand [§]	√	√	7	7	7 [‡] (100)	26	170
UK	√		70	35	5 (10)	37	97
US		√	125	72	29 (40)	179	472
Total			339	241	105 (42)	414	1149

*2011: most recent available data.

†2008: when most data were collected.

‡Seven represents number of schools that had responses of faculty and students/graduates. Responses from deans were three.

§Thailand have both types: research only and research/coursework programmes.

Table 2 Faculty and students/graduates perception difference* in seven countries.

Group	Programme	Faculty	Resource	Evaluation
Faculty	3.16	3.31	2.99	3.07
Students/graduates	3.07	3.28	2.99	3.01
Total	3.11	3.28	3.00	3.13
ANOVA				
F-statistic (P value)	4.43 (P = 0.04)	0.59 (P = 0.45)	0.26 (P = 0.61)	1.08 (P = 0.30)

Scores: 1 = *strongly disagree* to 4 = *strongly agree*.

*Difference: overall combined means of seven countries.

Table 3 QNDE mean scores* by domains, F-statistics for ANOVA and MANOVA tests[†].

Country	Programme	Faculty	Resource	Evaluation
US	3.36	3.44	3.21	3.36
Korea	2.91	3.13	2.67	2.71
Thailand	3.18	3.24	3.03	3.16
UK	2.89	3.14	2.99	2.27
South Africa	3.01	3.23	2.90	2.96
Japan	2.70	3.16	2.73	2.64
Australia	2.84	3.06	2.99	2.46
Total	3.11	3.28	3.00	3.13
ANOVA				
F-statistic (P value)	57.93 (<0.01)	15.88 (<0.01)	34.23 (<0.01)	49.02 (<0.01)
MANOVA				
F-statistic (P value)	14.86 (<0.001)			

*Scores: 1 = *strongly disagree* to 4 = *strongly agree*.

[†]Scores represent combined means of scores of faculty and students/graduates.

did students, while in Japan and South Africa, students/graduates perceived faculty and resource more positively than did faculty.

Comparisons of the four domains of QNDE among seven countries

The seven-country data on the four domains of the QNDE questionnaire were compared by using ANOVA (Table 3). Statistically significant differences among the seven countries were found in all four domains and no significant differences were noted between faculty and students/graduates' responses. When relationships between domains were examined, the highest correlation was between programme and faculty ($r = 0.75$), the lowest was between resource and evaluation ($r = 0.48$). All bivariate correlations were statistically significant. Two middle income countries, Thailand and South Africa that participated in

the study showed comparable findings to high income countries. Both countries have quite advanced university/college of nursing systems for doctoral education. Thailand has strict quality management system by the Ministry of Education. Universities have to meet the criteria for offering PhD programme and the number and faculty qualification otherwise they cannot admit the students. South Africa has had a PhD programme in Nursing, since 1978 and therefore has an advanced university system comparable to developed and some high income countries.

Relative importance of the four domains

The seven-country data of faculty and students/graduates on the QNDE were pooled at the country level. Data from each school of the country were then combined to make comparisons of the QNDE across the countries. A regression model was used to estimate the importance of attributes. Because the overall quality dependent variable is an ordinal variable, an ordered logistic regression model was applied to the four domains. Table 4 shows the Chi-square test results ($\chi^2 = 292.26$, $P < 0.001$) indicating the significance of the model in explaining the variation in overall quality across the seven countries. This model explained 33% of the total variance of perceived overall quality of the doctoral programmes. The estimated coefficients of each domain can be used to represent the relative importance of the attribute (i.e. domain) to overall quality of nursing doctoral education. The largest estimated domain coefficient was the faculty domain ($b = 1.516$), followed by programme ($b = 1.378$) and resource domains ($b = 0.956$); all were statistically significant except for the evaluation domain. Too much missing information in the evaluation domain made it difficult to make any definitive judgment of its importance. However, the estimated ordinal logistic regression model of the overall QNDE can only explain the average changes in the quality of nursing doctoral education according to the changes in the four QNDE questionnaire domains. Hence, a generalized ordinal logistic

Table 4 Relative importance by estimated coefficients of domains of QNDE on overall perceived QNDE.

Overall perceived QNDE	Estimated coefficient (b)	Robust SE	z	P > z
Programme	1.378	0.324	4.25	<0.001
Faculty	1.516	0.253	5.98	<0.001
Resource	0.956	0.302	3.16	0.002
Evaluation	0.629	0.333	1.89	0.059
/cut1	3.953	0.476	3.021	0.886
/cut2	8.581	0.625	7.355	9.807
/cut3	11.769	0.771	10.259	3.279
/cut4	15.299	0.658	14.009	6.588
Wald chi-square statistics (d.f. = 4)	292.26			<0.001
Pseudo R ²	0.331			
AIC	1332.48			
BIC	1361.24			

AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; d.f., degrees of freedom.

regression model was applied to identify the varying effects of the four domains on overall quality levels.

The estimated model using generalized logistic regression was also statistically significant in explaining the overall quality of nursing doctoral education for the four domains ($\chi^2 = 685.14$, $P < 0.001$), as presented in Table 5. This new model explained better than the estimation obtained with the ordinal logistic regression in terms of pseudo R² (0.34 from 0.33), Akaike Information Criterion (AIC;

1316.66 from 1332.48) and Bayesian Information Criterion (BIC; 1345.42 from 1361.24).

The results showed significantly different effects (determined by the size of coefficient shown in Table 5) of the four domains on the levels of overall quality of nursing doctoral education. At the relatively lower levels of overall quality of quality of nursing doctoral education, the programme domain had the largest effect on overall quality, followed by the faculty and the evaluation domains. The resource domain did not show any significant effect. As the overall quality level increased from good to excellent, the size of the resource domain increased to a similar level as the programme and faculty domains. The evaluation domain remained insignificant with regard to the overall quality of nursing doctoral education.

Discussion

We now discuss the major findings related to the specific aims and we integrated strategic directions into the discussion. Recommendations following the discussion section provide future direction.

This study focused on global differences among seven countries that constitute different types of educational systems, different healthcare systems, different economies and cultures. To understand the differences and similarities among countries, the findings from the seven countries were compared by combining the individual country-level QNDE domain scores. Differences were identified among the seven

Table 5 Generalized ordinal logistic regression model of overall programme quality

QNDE		Coefficient	SE	z	P > z
Poor vs. Fair, Good, Excellent	Programme	3.784	0.933	4.06	<0.001
	Faculty	2.205	0.574	3.84	<0.001
	Resource	-0.131	0.883	-0.15	0.882
	Evaluation	0.241	0.109	2.21	0.027
	cons	-12.683	2.716	-4.67	<0.001
Poor, Fair vs. Good, Excellent	Programme	1.624	0.148	10.98	<0.001
	Faculty	1.607	0.319	5.04	<0.001
	Resource	0.896	0.426	2.1	0.036
	Evaluation	0.818	0.334	2.45	0.014
	cons	-13.033	1.080	-12.07	<0.001
Poor, Fair, Good vs. Excellent	Programme	1.150	0.392	2.94	0.003
	Faculty	1.377	0.348	3.96	<0.001
	Resource	1.125	0.222	5.07	<0.001
	Evaluation	0.493	0.409	1.21	0.227
	cons	-14.134	0.873	-16.19	<0.001
Model chi-square statistics (d.f. = 16)	685.14	P value < 0.001			
Pseudo R ²	0.3443				
AIC	1316.66				
BIC	1345.42				

AIC, Akaike Information Criterion; BIC, Bayesian Information Criterion; d.f., degrees of freedom.

countries in the QNDE domains of programme, faculty, resource and evaluation. Among the four domains, the highest average score was for the faculty domain, followed by the programme, evaluation and resource domains.

Importance of domains and priority areas

Results showed that in the overall QNDE, the faculty domain was highest, followed by the programme and resource domains. The importance of the faculty and resource domains was reported in previous studies. For example, several investigations found that faculty shortage and lack of resources were linked with a decline in the quality of nursing doctoral education (Ketefian *et al.* 2005, Kim *et al.* 2010, Arimoto *et al.* 2012). This seven-country study confirmed and extended this by showing an increased importance of the resource domain with regard to higher levels of quality in nursing doctoral education.

The importance of the faculty domain is self-evident. Given the shortage of qualified nurse faculty, non-nurse faculty members were substituted as supervisors in some countries. While interdisciplinary education is lauded, having non-nurse faculty members playing dominant roles raises concerns about the nature of nursing education and research and questions whether the integrity of the discipline is being maintained.

For instance, in the country where non-nurse faculty members took the primary supervisory role, the role of co-supervisor who was an expert in nursing was limited (with Gregg, personal communication). This viewpoint is supported by the findings of a study by Kayama *et al.* (2013) that showed that the supervisor with basic medical research specialization had a difficult time monitoring or evaluating qualitative nursing research dissertations.

This is not merely a problem for nursing. Some educators have noted a 'lowering of quality' in most countries and further, that 'the number of faculty...with doctorates is quite modest' (Matthews 2013, p. 13). There is growing concern in the UK where non-nursing students are registering for PhD in schools of nursing. The reason is that, at around £12,000 per year, the PhD scholarships are attractive to prospective students in other fields, while nursing doctoral students prefer to work in health care at double that income. Anecdotally, nurse leaders have noted a similar trend in Australia.

The importance of the programme domain signifies the central role it plays in the quality of nursing doctoral education; items relate to curricula and environmental support. In particular, the findings of the Korean study showed the programme domain to be of greatest importance. Responses

to specific questionnaire items in the programme domain showed low agreement with the following: the university/institution values research and scholarship; schools had environments conducive to learning; supportive infrastructure for education; and sufficient materials and information for students (Kim *et al.* 2012). A milieu conducive to doctoral study was seen as crucially important by the Quality Assurance Agency for Higher Education in the UK (QAAHE 2011). In the US study, the higher quality of school programme was significantly related to lower time to degree (Kim *et al.* 2014).

In the South Africa study, the favourability ratings were first in the quality of academic personnel (faculty), followed by the curriculum (programme) and resource domains. Responses to the evaluation domain showed that the responding schools had regular evaluation of the programme either at the university or school level.

The resource domain played a prominent role. When the overall quality changed from good to excellent, the importance of the resource domain increased, even though it was not statistically significant at the lowest quality level. In addition, the importance of the resource domain was more aligned with countries that had a higher level of quality.

Close examination of items included in the resource domain suggests that these are enriching elements that could improve quality but are not necessarily vital for providing doctoral education, particularly in the beginning phase. Hence, it is plausible that countries/schools in the early stages of doctoral education or at lower levels of quality would need to secure vital elements such as faculty and programme before these more enriching elements. It is also reasonable to expect that the strong impact of resources on the programme and faculty domains could lead to a higher level of quality in doctoral education. This was particularly true with the UK data, which showed the importance of the resource domain over the three other domains (McKenna *et al.* 2014). The importance of a resource such as research infrastructure has been reported in the UK by the QAAHE (2011) and in a study by Minnick *et al.* (2010). It is also a core element in the UK Government's Research Excellence Framework (REF) criteria (HEFCE 2014). In South Africa too, infrastructure support is deemed important for building research capacity (Uys & Klopper, personal communication).

Recommendations

Multi-lateral global programmes for the exchange of faculty and students for learning and networking among countries

are recommended to enhance the quality of nursing doctoral education. More systematic and comprehensive global collaboration plans that secure greater affordability and flexibility with consideration given to national contexts would enhance the success of global doctoral education. Faculty and doctoral students from low and middle income countries could gain individualized experience in countries where doctoral education has matured, with many seasoned mentors are engaged in research, in environments that are enriching can be instructive and can serve as models for the visiting scholars.

Government agencies and international professional organizations such as the International Network for Doctoral Education in Nursing (INDEN; <http://www.nursing.jhu.edu/inden>), International Council of Nurses (ICN; www.icn.ch) and Sigma Theta Tau International (STTI; www.nursingsociety.org/) could play pivotal roles in developing, supporting and hosting exchange programmes and networking.

In addition, within-country initiatives, national and regional networks could facilitate collaboration for the advancement of doctoral education and research. The East Asian Forum of Nursing Scholars (EAFONS; <http://medicine.nus.edu.sg/nursing/eafons/>) is an example of a regional network (Tilokskulchai & Srisuphan 2013), as is the European Academy of Nursing Science (EANS; <http://www.european-academy-of-nursingscience.com/>).

Limitations

This global study had several limitations. Access to participants was one of the most difficult challenges, as the lists of faculty, students and graduates from each college and country were not directly available to the investigators; hence, it was necessary to rely on school liaisons to contact participants. For example, while 97 doctoral students/graduates and 37 members of staff (faculty) completed the online questionnaires in the UK, the number of nursing schools that responded was low. This may be the result of having different questionnaires and relying on busy school liaisons to distribute the questionnaires to staff (faculty) and students. Collecting the data during the summer months could also have affected response rates.

Accessing graduates/alumni was even more challenging, as many schools of nursing and countries did not have updated lists that were publicly available. The wide range of response rates and missing data in the seven countries suggest potential biases may exist in the comparison scores of *QNDE* and hence limit the generalizability of our

findings. More comprehensive school-level questions could have been included in the questionnaire survey. This could have helped us gain insights and interpret the findings more thoroughly and enabled us to better compare the status of doctoral education profiles among schools and countries. Missing data on evaluation domain are another limitation. A clearer explanation on the items included in the evaluation domain could have helped get more responses.

Conclusion

Comparison of the quality of nursing doctoral education in seven countries allowed the identification of priority domains/areas for quality nursing doctoral education at the global level. This study showed that both faculty and students/graduates rated overall quality of nursing doctoral education as good to excellent. It showed that all four domains (faculty, programme, resource and evaluation) were important elements for ensuring quality in nurse doctoral education. However, depending on the country and the maturity of the country's doctoral education, the importance of the domains varied. For example, the resource domain gained statistically significant importance as the overall quality level of nursing doctoral education increased. This study also showed the potential usefulness of the *QNDE* questionnaire for assessing the quality of nursing doctoral education.

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Conflict of interest

No conflict of interest has been declared by the authors.

Author contributions

All authors have agreed on the final version and meet at least one of the following criteria [recommended by the ICMJE (http://www.icmje.org/ethical_1author.html)]:

- substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
- drafting the article or revising it critically for important intellectual content.

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