

The relationship between the levels of nurses' competence and the length of their clinical experience: a tentative model for nursing competence development

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Aims and objectives. To explore the relationship between the levels of nurses' competence and the length of their clinical experience, in order to provide a tentative model of the continuing competence of nurses.

Background. The professional development of employees has attracted great interest. This interest has led to the development of various models that illustrate how employees develop their competence throughout their careers. However, little is known of how nurses maintain and develop their competence throughout their career pathways.

Design. A cross-sectional design was used.

Methods. Using a survey method, five dimensions of self-assessed nursing competence and the length of the nurses' clinical practice were measured ($n = 325$). Each dimension of competence was plotted against the length of their clinical experience using locally weighted scatterplot smoothing. Then, the shapes of the plots were analysed by fractional polynomial regression analysis.

Results. Overall, the relationships between the levels of nursing competence and the length of clinical experience were illustrated by curves with a rapid increase in competence levels at the early stage of the nursing career and a slower increase later. These curves were modelled by either a logarithmic, square-root function or its reciprocal. The results supported the learning curve model.

Conclusions. The competence development of nurses may be characterised by two distinctive periods: a rapid growth period followed by stable periods. However, the modality of the growth may be different depending on which dimension of nursing competence is in focus.

Relevance to clinical practice. The level of nursing competence directly affects the quality of care provided to patients. The findings of the study enable healthcare organisations to take proactive approaches to enhance nurses' competence by identifying when and how to assist nurses.

Key words: competence, learning curve, nurses, the length of clinical experience

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Introduction

Continuing competence has been a much discussed concept in nursing in the past decade, as it ensures that the public have access to quality nursing care. By definition, nursing

competence is the ability of a nurse to effectively demonstrate a set of attributes, such as personal characteristics, values, attitudes, knowledge and skills, which are required to fulfil his/her professional responsibility (Takase *et al.* 2011). It is the exhibition of this competence that enables a nurse to

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provide safe and effective patient care (Axley 2008, Valloze 2009).

But, what connotations does 'continuing' competence carry? According to the Oxford Dictionary of English (2005), 'continue' means 'remain in a specified position or state' (p. 374). Thus, continuing competence indicates that a person remains competent. More specifically, continuing competence requires nurses to maintain their current knowledge, skills and attitudes to offer standard nursing care in a rapidly changing healthcare environment (Arcand & Neumann 2005, Philipsen *et al.* 2007). It does not mean that nurses remain at the level of competence they had at the time of registration. The current concept of continuing competence, however, involves more than keeping pace with healthcare advancements. It also demands continuous professional development, through which nurses acquire a higher level of competence throughout their career pathways (Canadian Nurses Association 2000). This means that maintaining a certain level of competence, that is enough to offer standard nursing care, is no longer sufficient. Through formal and informal learning, nurses are required to provide high-quality nursing care, acquire new competences in areas they were not previously familiar with and develop the competence that they have already achieved at certain levels (Canadian Nurses Association 2000).

Continuing the competence of nurses has become a mandatory requirement of healthcare organisations, professional nursing bodies and the public (Munro 2008). Nevertheless, little is known about how the level of nurses' competence changes throughout their career pathway. Apparently, the lack of this knowledge hinders the development of appropriate interventions to support the continuing competence of nurses.

Background

Development models

The professional development of employees has attracted great interest from researchers, educators and managers in various occupational fields. As a result, this interest has led to the birth of four types of ideas and models that illustrate how employees grow throughout their careers/with experience. The first and the most classic idea of employees' growth is that employees' competence increases linearly as they gain more experience (see Model A of Fig. 1). This idea is not explicitly articulated, but rather implicitly indicated in the use of Pearson correlation or linear regression analysis when researchers investigate the relationship between nursing competence and the length of clinical experience. The well-

known assumptions of these analyses are that variables in question are linearly related to each other (Harris 1995). The preceding studies reported weak Pearson correlation coefficients of around 0.35 (Humpel & Caputi 2001, Meretoja *et al.* 2004a,b) or a regression coefficient of 0.17 (Saeki *et al.* 2007).

Another model depicting the competence development of employees was introduced by Drejer (2000) based on the work of Dreyfuss and Dreyfuss (1986). In this model, five developmental categories of employees are identified: the lowest level is 'novice', moving on to 'advanced beginner', 'proficient', 'expert' and to the highest level of 'world class'. Employees are assumed to grow by moving up through these developmental categories, and thereby demonstrate superior competence and performance. This is possible, as they gain more experience and learn from it. A unique feature of this model is that it illustrates competence development using a step-function (see Model B in Fig. 1).

Lyneham *et al.* (2009) proposed an alternative model, partly based on Benner's model of 'Novice to Expert' (Benner 2001). Rather than conceptualising competence development as a step-up function, they see it as a smoothly increasing exponential function. The basic assumption of their model is that 'a growth in practice capacity is a function of knowledge and reflective time within the power of experience' (Lyneham *et al.* 2009, p. 2480). The proposed mathematical model is therefore $y = (k+x)^e$, where y stands for practice capacity, k for knowledge, x for reflective time and e for experience. This model assumes that nurses' competence level increases slowly in the early stage of their career, and then rapidly later. The model is described in Fig. 1 (Model C).

The last model introduced in this article is the learning curve model (also called the experience curve model). This model resulted from observations that production costs declined (or employees' performance improved) at a certain rate with each doubling of cumulative output (Ghemawat 1985, Waldman *et al.* 2003). The learning curve is illustrated in Model D of Fig. 1. As seen in the model, employees' competence (or performance) increases rapidly in the early stage of their career as they repeatedly perform tasks and learn from their experience. However, the rate of improvement declines at the later stage, as employees' ability hits a ceiling or there are fewer and fewer things for them to learn from their experience. The distinction between Models C and D is that in Model D, rapid growth is expected to occur in the early stage of a career, while in Model C, it is assumed to occur at the later stage. The learning curve was identified in longitudinal studies that examined the growth of medical students' knowledge in medicine (Verhoeven *et al.* 2002, Van Diest *et al.* 2004), and residents'

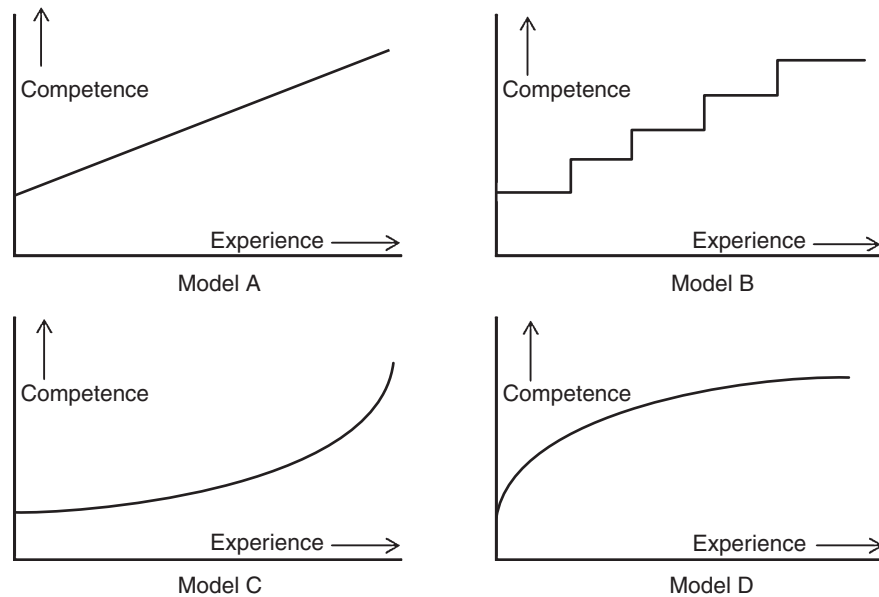


Figure 1 Four types of development models.

performance in medical procedures (Young *et al.* 2005, Bruch *et al.* 2009).

Barriers associated with the investigation into nurses' continuing competence

Despite the fact that various development models have been suggested, the empirical investigation into the competence development of nurses is a difficult task. This is because hospitals do not usually conduct regular assessments of nurses' competence using a valid scale. Moreover, there are barriers for researchers in following up on nurses' competence throughout their careers. For instance, conducting a longitudinal study is time- and resource-consuming. Furthermore, the end-results are often compromised by a high rate of loss of follow-up (see e.g. Pelletier *et al.* 2005, Gelsema *et al.* 2006, Tummers *et al.* 2006). In addition to this problem is the changing interpretation of what is meant by a 'concept'. According to Rogers (2000), a concept is time- and context-bound and evolves as the significance, the use and the application of the concept change. The evolution of the meaning of 'concept' indicates that the use of a scale that was developed to measure nurses' competence based on a conception of 20 years ago is inappropriate to measure the competence of nurses today. This is a dilemma in a longitudinal study.

A counter measure to these problems is to adopt a cross-sectional design, where the relationship between nurses' competence and the length of clinical experience can be explored. This method was used in the non-nursing studies of

Farrell and McDaniel (2001) and Williams *et al.* (2008). The identified learning curves in their studies were similar to those observed in comparative longitudinal studies. Thus, a cross-sectional study has the potential to inform how nurses maintain and develop their competence throughout their careers.

Aim

The aim of this study was to explore the relationship between the levels of nurses' competence and the length of their clinical experience, in order to provide a tentative model of the continuing competence of nurses.

Methods

Design

A cross-sectional correlational design was adopted in this study.

Participants

A convenience sample of 599 nurses was recruited from a university hospital located in the central west region of Japan. These nurses satisfied the following study criteria: the possession of current registration as a nurse (RN), working in an inpatient department and being involved in direct patient care. This group of nurses comprised 80% of the entire nursing population in this hospital.

Data collection

A survey method was used to collect data. Prior to data collection, verbal and written information regarding the purpose and the method of the study was provided to the Director of Nursing in the hospital, and written approval to conduct the study was obtained. Then, survey packages, each containing a cover letter, a questionnaire and a self-addressed reply-paid envelope, were distributed to the potential participants by internal mail in October 2010. The questionnaire consisted of demographic questions and a scale to measure nurses' competence. Participants were asked to complete the questionnaire and return it using the reply-paid envelope provided. Ten days after the distribution of the survey packages, a reminder card was sent to each potential participant to enhance the response rate. A total period of three weeks was allocated for the data collection.

Instruments

To measure nurses' competence, The Holistic Nursing Competence Scale (HNCS) developed by Takase and Teraoka (2011) was used. The HNCS consists of five factors. Factor 1 (nine items) evaluates competence in staff education and management. Factor 2 (nine items) assesses competence in engaging in ethically oriented practice. Factor 3 (seven items) identifies the general aptitude of nurses (i.e. personal characteristics required for nurses and includes such attributes as being compassionate and the tendency to critically view a situation). Thus, this factor was concerned with how frequently respondents engaged in behaviours related to, for instance, critical thinking and compassion, in general. Factor 4 (seven items) evaluates competence in providing nursing care in teams. Finally, Factor 5 (four items) appraises competence in managing one's own professional development. Factors 1, 2, 4, 5 were rated using a 7-point Likert scale ranging from 1 = not competent at all, 4 = reasonably competent, to 7 = extremely competent. Factor 3 was also rated using a 7-point Likert scale, but a different scaling system was used (i.e. 1 = not at all, 4 = sometimes, 7 = always). The construct validity of the scale was established by a factor analysis. The internal consistency of the scale was demonstrated by Cronbach's alpha = 0.967, with all coefficients at a factor-level exceeding 0.70 (see more details in Takase & Teraoka 2011).

Ethical considerations

This study was conducted after receiving the approval of the Ethics Committee of the Department of Nursing at Hiro-

shima University, which was obtained in 2010. Participants were provided with information regarding the purpose, method and ethical guidelines of the study in the cover letter. They were also informed that anonymous return of the questionnaire was assumed to indicate consent to participate in the study.

Data analysis

To explore the relationship between nurses' competence and the length of their clinical experience, two types of analyses were planned. The first analysis aimed at producing a graph identifying the relationship between nurses' competence and the length of their clinical experience. For this analysis, locally weighted scatterplot smoothing (LOWESS) was used. The LOWESS calculates a series of regression lines with small intervals of the scores in an independent variable. It then connects and evens out the lines, and then produces a graphical representation of the relationship between the two variables (Cleveland 1979). This is a flexible way of identifying the relationship (i.e. it is not restricted to a particular shape of line such as a straight line) between nurses' competence and the length of their clinical experience.

If the relationship manifested other than a step-function in the first analysis, the second analysis was conducted. The aim of this analysis was to create a mathematical model illustrating the relationship between competence and experience. For this analysis, fractional polynomial regression analysis was used. This analysis began by transforming an independent variable X (i.e. the length of clinical experience) into a series of power functions (e.g. X^2 , \sqrt{X} , $\ln X$). Then, a dependent variable was regressed on each transformed variable until the best fitting power transformation was identified (see Ambler & Royston 2001 for a more detailed explanation). In this analysis, the effect of educational qualification was controlled for, as it can impact on the development of nurses' competence.

Results

A total of 350 questionnaires were returned, representing a return rate of 58%. Of these, 325 questionnaires, which did not have missing responses to the questions measuring nurses' competence, the length of clinical experience and educational qualification, were used in the analysis. Of 325 nurses, 299 were women (92.0%) and 26 (8.0%) were men. The mean age of these nurses was 29.79 (SD = 8.10) years, and the majority of the nurses were not married (76.0%). The educational qualifications of the nurses were as follows: bachelor's degree (44.9%), three-year nursing diploma

(31.1%), other types of nursing diploma (15.1%), associate degree (4.6%), postgraduate degrees (2.2%) and others (2.2%). In addition, six nurses (1.9%) were qualified as certified nurses. This means they were trained in advanced skills and knowledge in a specialised area of nursing by undertaking a six-month postregistration programme. At the time of the study, the nurses were working in the following clinical areas: mainly surgical wards (27.3%), medical/surgical wards (18.6%), mainly medical wards (13.3%), intensive care unit or emergency department (10.2%), gynaecologic/obstetric ward (11.5%), paediatric wards (8.4%), operating theatre (5.3%) or other clinical areas. The majority of them were working as staff nurses (87.0%). The average length of clinical experience of the nurses was 6.77 (SD = 7.43) years with less experienced nurses dominating the sample. This age distribution is typical of a Japanese university hospital. The average length of their clinical experience in the current hospital was also relatively short, at 5.86 (SD = 6.82) years.

Figure 2 shows the results of LOWESS. The relationship between the general aptitude of nurses and the length of their clinical experience was depicted by a fluctuating line. However, overall, the scores for general aptitude were stable, irrespective of how many years they had practised nursing ($M = 4.28$, $SD = 0.78$). In contrast, the plots illustrating other aspects of nursing competence tended to show incremental smooth curves as the scores for the length of clinical experience increased. Moreover, the increment was rapid in

the early stage of the nursing career and slower later on, which supported Model D in Fig. 1.

In general, nurses considered themselves as most competent in providing ethically oriented care ($M = 4.71$, $SD = 0.94$), followed by providing nursing care in teams ($M = 4.53$, $SD = 0.98$). The plots illustrating the changes in these competencies show a similar curve pattern, with the slope being relatively steep for the first 10 years and almost flat afterwards. The competence in staff education and management was, on the other hand, rated lowest by the newly graduated nurses ($M = 3.64$, $SD = 1.07$ for the entire sample). However, the relationship between nurses' self-evaluation of this competence and the length of their clinical experience was illustrated by the steepest curve with diminishing acceleration. By the time the curve passed the 10-year point in clinical experience, it became almost linear with constant increments. The competence in managing one's own professional development was also scored below the scale mid-point by the graduate nurses ($M = 3.76$, $SD = 1.01$ for the entire sample). However, the plot showed an upward line with a mild curve as the length of clinical experience increased.

Table 1 and Fig. 3 show the results of fractional polynomial regression analysis. Table 1 shows that the curve illustrating the changes in the overall competence was best described by a logarithmic transformation of the length of clinical experience ($adjR^2 = 13.8\%$). The application of a logarithmic transformation was also used to describe the

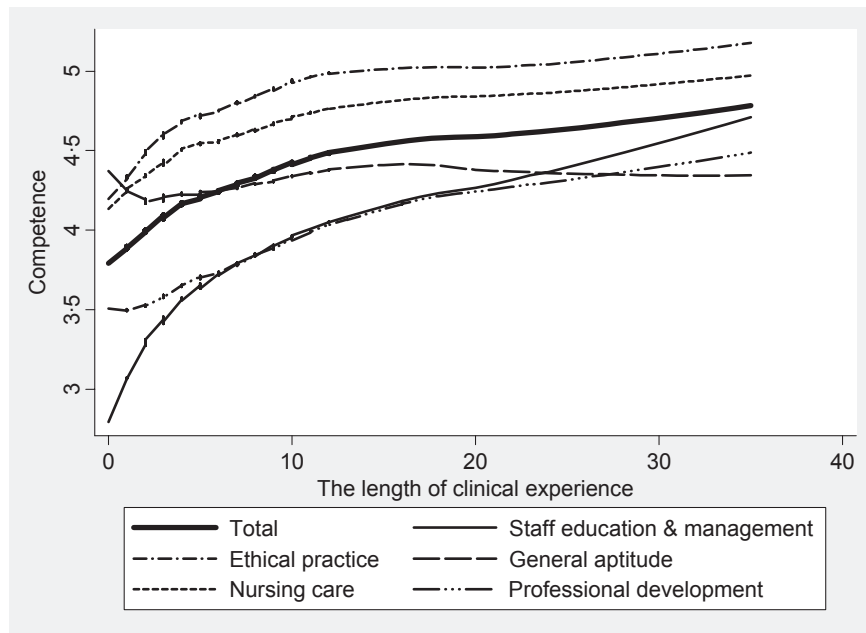


Figure 2 Locally weighted scatterplot smoothing illustrating the relationships between the levels of nursing competence and the length of clinical experience.

Table 1 The results of fractional polynomial regression analysis

		Coefficient	SE	<i>t</i>	<i>p</i>	adjR ²
Factor 1	$T = \ln X^* + 0.25$	0.47	0.06	7.54	0.00	0.22
	Educational qualification	0.27	0.12	2.37	0.02	
	Constant	3.96	0.07	54.68	0.00	
Factor 2	$T = 1/\sqrt{X^*} - 1.13$	0.40	0.07	5.49	0.00	0.12
	Educational qualification	0.08	0.10	0.81	0.42	
	Constant	4.94	0.07	73.50	0.00	
Factor 3	$T = X - 6.71$	0.01	0.01	1.52	0.13	0.00
	Educational qualification	0.04	0.09	0.49	0.63	
	Constant	4.23	0.06	73.11	0.00	
Factor 4	$T = \ln X^* + 0.25$	0.24	0.05	4.51	0.00	0.09
	Educational qualification	0.16	0.10	1.66	0.10	
	Constant	4.70	0.06	76.70	0.00	
Factor 5	$T = \sqrt{X^*} - 0.88$	0.77	0.15	4.99	0.00	0.08
	Educational qualification	0.04	0.12	0.35	0.73	
	Constant	3.83	0.07	52.02	0.00	
Overall	$T = \ln X^* + 0.25$	0.29	0.05	6.13	0.00	0.14
	Educational qualification	0.11	0.09	1.25	0.21	
	Constant	4.39	0.06	78.78	0.00	

T = transformed length of clinical experience. X = the length of clinical experience, whereas X^* = (the length of clinical experience + 1)/10. The educational qualifications of the nurses were dichotomised into 0 = non-university degree holders and 1 = university degree holders.

curves that illustrated the changes in the competence in the area of staff education and management (adjR² = 21.7%), as well as in providing nursing care in teams (adjR² = 9.2%). As for the plot for ethical competence, the reciprocal of a square-root function was chosen to transform the length of clinical experience, and this explained 10.6% of the variance. A square-root transformation of the length of clinical experience was also used to describe the curve plotting the competence level of managing professional development (adjR² = 8.4%). These transforming functions (i.e. a logarithmic, square-root function and its reciprocal) give curves with rapid increments at the beginning and slow increments later. Thus, the results of fractional polynomial are consistent with those of LOWESS.

As for the competence in general aptitudes, Table 1 indicates that a linear transformation of the length of clinical experience was determined as the best solution to predict nurses' competence levels by the fractional polynomial. Nevertheless, this did not explain the changes in the competence level. This result also agreed with that of LOWESS, which showed that the scores of the general aptitude were constant, irrespective of the length of the nurses' clinical experience.

Lastly, Table 1 shows the effect of the educational background of nurses (i.e. whether or not they had a university degree) on their levels of competence. The results indicated that nurses who did not have a university qualification scored higher for competence in staff education and management

than their degree counterparts. However, the effect of educational qualifications was not evident in other aspects of nursing competence. The readers can contact the author if further information is required.

Discussion

This study has demonstrated that the levels of nurses' competence increase through the course of their clinical experience. This finding is consistent with past studies (e.g. Chang *et al.* 2011). As for the shape of competence development, the results of this study did not show that nurses' competence grows linearly (as depicted in Model A) or accelerates (i.e. Model C) as they accumulate years of practical nursing experience. The results also demonstrate that nurses do not step up from one level of competence to another (i.e. Model B). There may be an incident from which a nurse gains a considerable insight into nursing, and which pushes him/her to the next level of practice. However, such an incident is unlikely to occur for every nurse with predetermined length of clinical experience. This is because nursing experience varies in terms of professional role, setting, clients and therapeutic modalities (Sportsman 2010). This may be the reason why the relationship between nurses' competence and the length of experience was not described by a step-function.

In contrast, the overall findings of this study lend support to the growth curve model (i.e. Model D). During the first

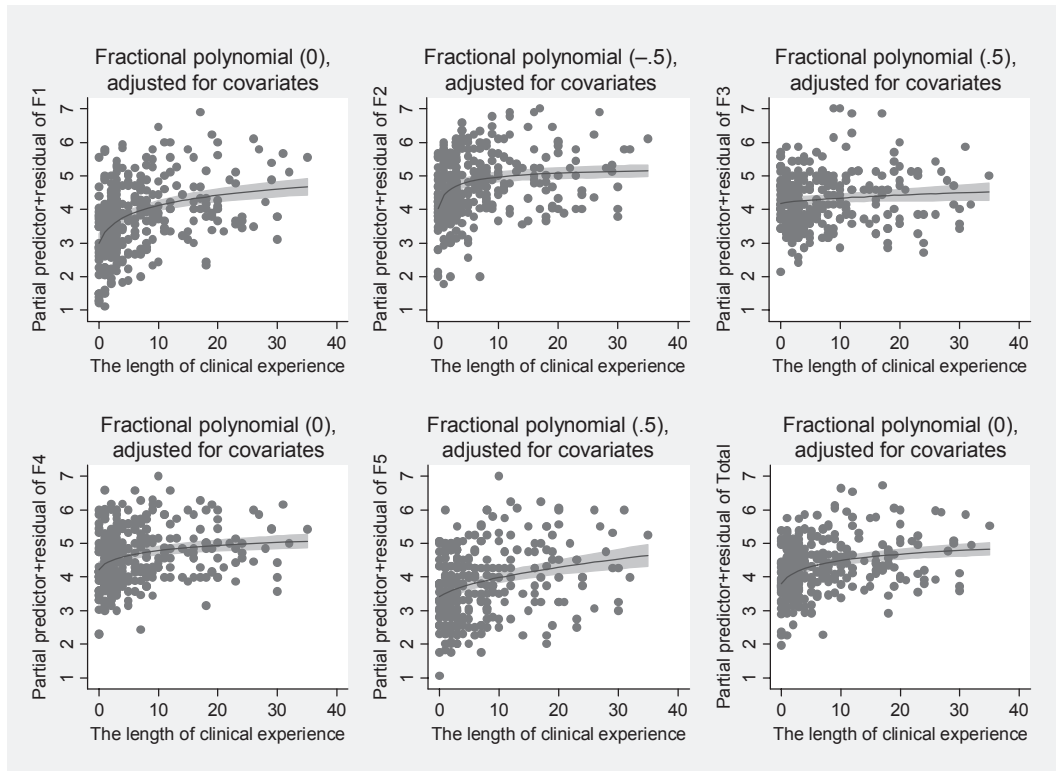


Figure 3 The results of fractional polynomial regression plots with 95% confidence intervals. Note: the numbers in the brackets after 'Fractional Polynomial' indicate the following: 0 = a logarithmic function, 0.5 = a square-root function and -0.5 = the reciprocal of a square-root function. Educational qualification (0 = non-degree holders, 1 = university degree holders) served as the covariate. In the vertical axis, F1 = competence in staff education and management, F2 = competence in engaging in ethically oriented practice, F3 = the general aptitude of nurses, F4 = competence in providing nursing care in teams, F5 = competence in managing one's own professional development and total = the mean of total competence scores.

10 years of clinical experience, the level of nurses' competence was described by a rapidly increasing curve. After 10 years, the competence level remained relatively stable, characterised by either a flat or an upward line with a gradual increment. The first 10 years of clinical experience, especially the first few years, provide nurses with abundant learning opportunities. Nurses are exposed to a variety of successful and unsuccessful clinical experiences from which they gain new knowledge, skills and attitudes necessary for their work in the nursing profession (Jantzen 2008). Not only do they learn from their own experience, but they are also given the opportunities to learn from the experience of others (Jantzen 2008). In the early stage of their professional life, nurses have an unfilled capacity, which allows the rapid absorption of newly acquired skills and knowledge from their experience. It is the learning from experience through which individuals develop own competence (Drejer 2000).

After passing this growth period (i.e. the first 10 years of clinical experience), however, nurses' competence development appears to reach a stable period. In the current

literature, this period is interpreted in two ways. The first interpretation is a consolidation period. According to Tabari-Khomeiran *et al.* (2007) who identified the phases of competence development, the period of learning through experience is followed by the consolidation period. The consolidation period occurs when nurses gain complete mastery of their practice by refining their performance through repeated practice, and by confronting new and challenging situations (Tabari-Khomeiran *et al.* 2007). Consolidation does not mean that nurses' growth halts. Rather, they are firming up their performance and preparing for further growth. It is this nature of competence development that may stabilise the growth trajectory.

In contrast to Tabari-Khomeiran *et al.* (2007), Tsuji *et al.* (2007) argue that the stable line demonstrates a career plateau, meaning that nurses' competence development stagnates. Nurses' capacity to absorb from experience hits its ceiling, either because they have no further capacity to absorb new things or there is no new or challenging experience to encourage them to grow (McCleese *et al.*

2007). As a consequence, they are stranded in the current position and are unable to go on to the next stage. This phenomenon is also observed in other professionals in their mid-career (Smith-Ruig 2009) and is known to be correlated with negative psychological states such as frustration (McCleese *et al.* 2007).

It is uncertain which of the theories, either consolidation or a career plateau, explain this stable period better. Perhaps, it is reasonable to assume that there are some nurses who are consolidating their competence, and others who are stuck in the current position. This assumption is reflected in the findings of Llahana and Hamric (2011), who investigated the developmental stage of diabetes specialist nurses and found that some nurses experienced an integration phase, while others experienced negative developmental phases characterised as 'frozen' and 'frustration'.

The findings of this study also demonstrated that the shapes of the curves are different, depending on which aspect of competence is plotted against the length of clinical experience. As for competencies in ethically oriented practice and the provision of nursing care, the plots started with relatively high scores and showed mild increments. These two aspects of competence form the core of nursing practice. Therefore, the development of these competencies is usually emphasised during clinical practice in preregistration education in Japan (Matshumoto *et al.* 2001, Nagatani 2010). This emphasis might have led to high starting points in these competencies. In turn, it might have left a limited space for nurses to grow. On the other hand, the plot for staff education and management started at a low point and exhibited a steep curve. The acquisition of this type of competence is not usually expected for students. Rather, it is expected to be acquired through immersion into actual clinical practice, where nurses become independent and competent professionals, and then become responsible for teaching and managing nursing staff. In other words, the development of this type of competence is more closely tied to clinical experience. This may be the reasons why the plot showed a rapidly increasing curve throughout the length of clinical experience, and why the length of experience accounted for the largest variance with nurses' competence levels. With reference to the general aptitude, the scores did not change much, irrespective of the length of clinical experience. The general aptitude in the HNCS encompasses certain aspects of personal traits and cognitive tendency that are required for nurses and that are associated with the development of other aspects of nursing competence (Takase & Teraoka 2011). Personal characteristics are the long-term products of individual past experience, thus are difficult to change once this experience has been developed (Myers

2007). This might be the reason why the plot for the general aptitude took the form of a straight horizontal line throughout the length of clinical experience.

Lastly, the findings of the study indicated that the development of nurses' competence cannot be explained well by the length of clinical experience and the educational qualifications. Only a small to medium variance was explained by the length of clinical experience. Moreover, the educational qualification impacted only on the development of competence in staff education and management. The result suggested that nurses without university qualifications had higher competence scores in education and management than their degree counterparts. However, this result may be attributed to the fact that in this study, the majority of veteran nurses who were responsible for teaching and managing did not have a university degree. Other influential factors, such as the effect of reflection (Lyneham *et al.* 2009) and the quality of experience, on the competence development need to be explored.

Implication for management

Because nurses go through different stages of competence development throughout their career, time-specific interventions are essential to improve their competence. According to the study findings, the development of nurses' competence can be significant in the first 10 years, and how much they can improve their competence by the end of this growth period may determine the level of their competence in the next 20–25 years. Therefore, educational investment is necessary to foster nurses' development in this period (Salonen *et al.* 2007). The investment may be made by providing formal educational courses or in-service education to nurses. However, because the major part of an individual's learning occurs in an informal or incidental manner in their everyday practice (Drejer 2000), the establishment of an environment that fosters learning from experience is also required. Such an environment provides nurses with opportunities to reflect on and learn from their own practice (Drejer 2000). It also allows them to use and stimulate their abilities, by exposing them to challenging situations or by introducing the use of new technology (Tabari-Khomeiran *et al.* 2007). This type of environment expands the width of nursing experience, thus promoting effective learning. In addition, an environment that emphasises a culture for continuous professional improvement is important, as it motivates nurses to develop their own competence (Tabari-Khomeiran *et al.* 2007, Ying *et al.* 2007).

As for nurses with more than 10 years of experience, improvement in their competence may be less conceivable. In this period, it is crucial to determine whether they are

consolidating their own competence or have stagnated at the current level. For those who have stagnated, drastic changes, which encourage them to move onto the next level of learning/development, are necessary. For instance, assigning them a new role or project, transferring them to another ward or even promoting them to a position with greater responsibility may help them learn new things that cannot be learned in the current position. Nurses neither develop their competence constantly nor entirely on their own. Appropriate organisational interventions are necessary to assist nurses in developing their nursing competence.

Limitations

There are some study limitations, which necessitate cautious interpretation of the study findings. First, the current study used a cross-sectional design to overcome the barriers in conducting a longitudinal study. Such a cross-sectional study assumes that the pattern of competence development is shared among nurses. Hence, plotting the relationship between nurses' competence level and the length of their clinical experience could reveal a nursing growth pattern that is comparable to that which would be identified in a longitudinal study. Although the purpose of this study was to explore the overall pattern of nurses' competence development, an examination of this assumption (i.e. the assumption that the pattern of competence development is shared among nurses) is necessary to justify the study findings. Second, this study was conducted in one hospital with a skewed distribution of clinical experience. Therefore, the findings of the current study may not be generalisable to the entire nursing population. A cross-validation study is warranted. Finally, the use of self-evaluation to measure nurses' competence level may attract criticism regarding the objectivity of the study findings. However, it is believed that nurses can critically review their own competence level (Takase & Teraoka 2011). Moreover, the self-evaluation is considered as an integral part of competence assessment (Cowan *et al.* 2008). This does not negate the use of the observational assessment. The findings of a study that used the assessment of others would certainly consolidate the current study's findings.

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Conclusion

The maintenance and the development of nurses' competence have been of concern to nursing. However, little is known about how nurses develop their competence throughout their careers. By exploiting a cross-sectional design, the current study offered a tentative model of competence development for nurses. The model suggested that competence development is characterised by two distinctive periods: a rapid growth period followed by stable periods. The model also highlighted that the modality of the growth may be different, depending on which aspect of nursing competence was in focus.

Relevance to clinical practice

The level of nursing competence directly affects the quality of care provided to patients. As such, assuring the continuing competence of nurses is the responsibility of nurses, health-care organisations and nursing professional bodies. Nonetheless, the primary responsibility for competency development is often left to an individual nurse (Jordan *et al.* 2008). The findings of this study may help organisations take more proactive approaches to enhancing nurses' competence by identifying when and how to assist nurses.

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Contributions

Study design: MT; data collection and analysis: MT and manuscript preparation: MT.

Conflict of interest

The author declares that they have no conflict of interests.

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