Knowledge management model for quality improvement in the hemodialysis unit of a non-profit private hospital, Bangkok, Thailand

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Abstract

Purpose – This study seeks to use a knowledge management (KM) model as a tool to improve the quality of service in a hemodialysis unit.

Design/methodology/approach – A quasi-experimental, one group pre-test-post-test study was conducted over a period of ten months at a hemodialysis unit. All of the staff in the unit, and all of the patients who came for hemodialysis at the outpatient department during the study period, were invited to participate. Self-administered questionnaires were used to measure staff job satisfaction and patient satisfaction. SF-36v2 was used to assess patient quality of life (QoL). Wilcoxon’s matched pairs test and paired t-test were used to compare staff job satisfaction, and patient satisfaction with service quality, before and after implementing KM. A within-subject repeated-measure analysis of variance (ANOVA) was used to assess changes in patient QoL. The chi-square test was used to compare rates of hemodialysis complications before and after implementing KM.

Findings – After implementing KM, staff job satisfaction and patient satisfaction with services, increased significantly. Three QoL domains – role limitations due to physical and emotional problems, and vitality – at three and six months post-intervention applying KM to daily work, had improved significantly. Complications per hemodialysis episode had also reduced.

Originality/value – The paper focuses on intervention that applied KM to staff providing care for patients with hemodialysis to improve care and outcomes.

Keywords Knowledge management, Quality improvement, Job satisfaction, Patient satisfaction, Hemodialysis, Quality of life, Thailand, Health services

Paper type Research paper

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Introduction
Healthcare organizations are facing a more complex, changing environment, together with high levels of competition. Advanced technologies and rapid change in customer demands make it more challenging for organizations to survive and remain competitive. Knowledge management (KM), which is the process by which people in organizations find, share, and develop knowledge for action (Orzano et al., 2008), is being applied successfully in business and different areas to promote knowledge creation and sharing, for the better utilization of organizational resources, and competitiveness (Toffler, 1990; Quinn, 1992; Drucker, 1993; Stewart, 1997). KM processes work together with the individual’s learning process and organizations in empowering, enhancing, and nurturing new knowledge and solutions for organizations. Nowadays, KM is a key quality-improvement indicator for many organizations. The principles of KM have wide application and value to the healthcare sector, particularly for hospitals (Guptill, 2005). However, very little research has been conducted into the application of KM for quality improvement in a hemodialysis unit.

Chronic kidney disease (CKD) is a major public-health problem worldwide (Schoolwerth et al., 2006). In 2009, the overall prevalence of CKD in Thailand was reported as 17.5 percent. The prevalence of CKD by disease stage was as follows: stage I (3.3 percent), stage II (5.6 percent), stage III (7.5 percent), and stage IV (1.1 percent) (Ingsathit et al., 2010). The overall quality of life (QoL) for the CKD patient is lower than the general population (Pakpour et al., 2010). Dialysis – hemodialysis or peritoneal dialysis – is the current treatment for kidney failure. The procedure demands high levels of professional skill and high-technology equipment, as well as patient collaboration in maintaining physical and mental status. The major complications reported are infection at the graft site, uncontrolled weight or water intake, and hypovolemic shock during the procedure (Krairittichai et al., 2006).

Non-profit private hospitals also play an important role in helping CKD patients. To improve service quality, it is very useful to empower hemodialysis-unit staff by introducing the KM model, which can facilitate organizational learning, both “single-loop” and “double-loop” learning. “Single-loop learning” means correcting an action, solving a problem, or avoiding an error. “Double-loop learning” means correcting the underlying causes behind a problematic action; thinking outside the box. It is another level of learning, where people not only reference the rules, but reexamine the norms, assumptions, or values of the prescribed single-loop response, leading to active constructions of alternative solutions and adaptation to change (Argyris and Schon, 1978). The intervention aimed to increase staff job satisfaction, patient satisfaction, patient QoL, and reduce patient complications from hemodialysis, in a non-profit private hospital.

Methods
A quasi-experimental, one-group pretest-posttest study was conducted at a non-profit, private, general hospital in Bangkok. The nephrology unit comprises two expert nephrologists, 12 well-trained and experienced nurses, and six technical staff. The hemodialysis center treats critical chronic-renal-failure patients using 12 modern, clean, and safe hemodialysis machines. This study had two sample groups. The first group comprised 20 staff in the hemodialysis unit, who had been working at least six months in the hospital and consented to participate in the study. Staff who transferred
to another department or left the hospital during the study period were excluded. The second group comprised 60 patients who met the following criteria: undergone hemodialysis treatment at the outpatient department of the study hospital at least twice, and had no severe chronic disease, i.e., heart failure, uncontrolled DM; and could communicate in Thai and were willing to participate in the study. Patients who had additional hemodialysis two to three times per week, and those who could not participate in the process due to admission, leaving, or dying during the study, were excluded.

At the beginning of the study, 60 patients who met the inclusion criteria completed the patient satisfaction and QoL questionnaires. At three months post-intervention, only 50 patients completed the same questionnaires, since eight patients had moved to other hospitals, one was admitted, and another had died. At six months post-intervention, only 42 patients completed the QoL questionnaire, since six patients had moved to other hospitals, one was admitted, and one patient died. The research protocol was approved by the Ethics Committee of the Faculty of Public Health, Mahidol University. Permission to conduct the study was also obtained from the Hospital Director and the Director of Nursing at the study hospital.

**Intervention**

The KM model process involved four steps, i.e., knowledge identification and capture; knowledge structuring; knowledge sharing; and, knowledge application in daily work (Nonaka and Takeuchi, 1995; Davenport and Prusak, 1998; Alavi and Leidner, 2001; Holsapple and Joshi, 2002; Sandars and Heller, 2006). The process of the KM model in this study had three phases: preparation; implementation; and evaluation (Figure 1).
Phase 1: preparation phase (two months)
The supervisor and head of the hemodialysis unit were informally approached at the very beginning to see the possibility of introducing KM model. Both of them agreed and committed to facilitate KM team as they wanted to improve quality and reduced complications in hemodialysis unit. Since the hospital has been accredited and quality improvement project was required in every department/unit. Then, the investigator asked for approval and support from hospital management. Sessions with top management and staff provided clear and brief introductions to the KM process, and the time-frame. The KM team was arranged by contacting the supervisor and head of the dialysis unit, including an introduction to the KM process. Two nephrologists who were full time staff were convinced by the hospital top management to become the leaders for healthcare team. Both of them were approached to introduce and support KM process, give clinical practices and improvement in caring consultation.

Phase 2: implementation (ten months)
This phase included five KM meetings and intervention applying KM to daily work. KM meetings were set with average one-month interval, except for the first and second meetings that were two weeks interval. The first meeting introduced the team to the KM process, with the principal investigator as facilitator. After introducing each member personally, the investigator explained the project objective, to improve service in the hemodialysis unit by implementing KM; next, the concepts of KM were clarified, implementation steps, and the benefits of KM. Then, the investigator invited discussion and questions.

The second meeting was designed to strengthen the KM team. The investigator met the KM team to reinforce the core concepts of KM and share knowledge with those members who could not attend the workshop, and to clarify some issues raised. The investigator also tried to improve the staff's morale and attitudes towards service improvement through discussion and support.

The third meeting, which consisted of sharing knowledge, was conducted with an expert nurse from Chulalongkorn University Hospital, a public hospital in which the hemodialysis unit was acknowledged as achieving best practice in the entire country. The meeting aimed to enhance relationships between the expert and staff of the hemodialysis unit; sharing experiences – success stories from the expert, and promoting double-loop learning in practice.

The fourth meeting consisted of defining the explicit knowledge generated from clinical trials and stored within a variety of “evidence-based clinical guidelines” (Sandars and Heller, 2006). The team reviewed the present core processes in caring and practicing “double-loop learning”, e.g. reviewing the unit’s norms and manuals related to the caring process, and looking for new solutions. Team members were encouraged to share their thoughts and experiences in a friendly atmosphere. The team was encouraged to seek the coordination of multidisciplinary staff to improve the quality of care.

The fifth meeting was conducted to define tacit knowledge, i.e. knowledge in the human mind that is acquired from experience, and which is difficult to externalize or mediate (Nonaka and Takeuchi, 1995). This meeting was shared with a nutritionist, to provide a better understanding and self-realization of the need for well-managed nutrition among patients and relatives; to enhance relationships among staff and
patients, and among themselves, and to promote self-care and fewer complications
during hemodialysis.

Phase 3: evaluation phase
After one month of KM implementation, the investigator met the KM team members to
maintain contact and ascertain whether the KM implementation process was being
followed. Observations were noted and a checklist was used to assess conformity with
the plan. Consultations with nephrologists were re-arranged such that patients could
have more appropriate regular contact, and charts were reviewed systematically. The
numbers of complications per hemodialysis episode during the previous three months
and the six months post-applying KM to daily work were obtained from the unit’s
records. Changes in staff satisfaction and patient satisfaction were assessed at before
and at three months post-intervention. Changes in patient QoL and complications were
assessed at before and at three and six months post-applying KM to daily work.

Measurements
The data-gathering instrument was a five-part questionnaire:

1. Part I consisted of five closed-ended questions about the staff-member’s general
   characteristics, including sex, age, marital status, education, and work
   experience.

2. Part II surveyed staff job satisfaction, using 18 items from the modified
   Herzberg’s two dimensions of job satisfaction, scored with a five-point
   rating-scale (1 = least satisfied, 2 = less satisfied, 3 = satisfied, 4 = very
   satisfied, and 5 = most satisfied). The five domains were: work itself,
   responsibility, recognition, achievement, and advancement. Possible scores
   ranged between 18-90. The Cronbach’s alpha was 0.93.

3. Part III comprised eight closed-ended questions about the patient’s general
   characteristics, including sex, age, marital status, education, occupation, family
   income, payment for treatment, and complications.

4. Part IV dealt with patient satisfaction with quality of services. This was a
   ten-item questionnaire with a five-point rating format (1 = least satisfied,
   2 = less satisfied, 3 = satisfied, 4 = very satisfied, and 5 = most satisfied).
   The three domains were: providers, medicine, equipment and facilities, and
   continuity of care. Possible scores ranged between 5-50. The Cronbach’s alpha
   was 0.81.

5. Part V dealt with the patient’s QoL, which was measured by SF36 V2 (Ware
   et al., 2001). This is a multi-item scale consisting of eight domains. The response
   for each item was recoded with a value ranging between 0-100, with 0
   representing the worst HRQOL score and 100 the best. The Cronbach’s alpha
   coefficient of each domain was as follows: physical function (0.945), physical
   role (0.871), bodily pain (0.791), general health (0.849), vitality (0.710), social
   function (0.813), emotional role-function (0.708), and mental health (0.835).

Data analysis
Descriptive statistics, i.e. percent, mean, and standard deviation, were used to describe
all study variables. Wilcoxon’s matched-pair test and the paired t-test were used,
respectively, to compare staff job satisfaction and patient satisfaction with quality of services before and after implementing KM. A within-subject repeated measure analysis of variance (ANOVA) were used to assess changes in patient QoL. The Chi-square test was used to compare hemodialysis complication rates before and after implementing KM. The significance level was set at \( p \leq 0.05 \).

**Results**

**Staff: general characteristics**  
Of the 20 unit staff, 19 were female and over half were married. The mean age was 35.7 years (range 21-52). Regarding educational level, 2 had master degrees, 14 bachelor degrees, and 4 high-school. The median work experience was 12 years (range 2-32 years).

**Staff: job satisfaction**  
After implementing KM, there were significant differences in overall means for staff satisfaction, and means for each domain \( (p = 0.001) \), except for advancement (Table I).

**Patients: general characteristics**  
Of the 60 patients who completed the patient-satisfaction questionnaire, 55.0 percent were female. Patient ages ranged between 33-93 years (mean 62.3). A total of 63.4 percent were married, and 23.3 percent were widowed or separated. A total of 50.7 percent were at elementary/secondary level. Considering occupation, 53.3 percent were housewives or unemployed, and 25.0 percent were self-employed. A total of 43.3 percent had family incomes of 30,001-50,000 Baht/month. 66.7 percent paid the medical expenses by themselves (Table II).

**Patients: satisfaction**  
Overall patient satisfaction was significantly different after implementing the KM model \( (p = 0.003) \). For each individual domain, only continuity of care did not increase significantly \( (p = 0.074) \) (Table III).

**Patients: quality of life**  
After implementing the KM model, three domains of patient QoL increased insignificantly, i.e. role limitations due to physical health problems \( (p < 0.001) \); role limitations due to emotional health problems \( (p < 0.001) \), and vitality \( (p = 0.024) \) (Table IV).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before Mean</th>
<th>SD</th>
<th>After Mean</th>
<th>SD</th>
<th>( p )-value ( ^a )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall job satisfaction</td>
<td>57.5</td>
<td>9.4</td>
<td>69.0</td>
<td>8.8</td>
<td>0.001</td>
</tr>
<tr>
<td>Work itself</td>
<td>11.0</td>
<td>1.6</td>
<td>13.0</td>
<td>1.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Achievement</td>
<td>12.9</td>
<td>2.5</td>
<td>15.2</td>
<td>3.4</td>
<td>0.012</td>
</tr>
<tr>
<td>Recognition</td>
<td>12.1</td>
<td>2.9</td>
<td>15.6</td>
<td>2.7</td>
<td>0.002</td>
</tr>
<tr>
<td>Responsibility</td>
<td>9.5</td>
<td>1.6</td>
<td>11.7</td>
<td>1.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Advancement</td>
<td>12.0</td>
<td>2.9</td>
<td>13.6</td>
<td>2.9</td>
<td>0.124</td>
</tr>
</tbody>
</table>

Notes: \(^a\)Wilcoxon’s matched pairs test; \( n = 20 \)

Table I.  
Staff job satisfaction before, and three months after, implementing KM.
<table>
<thead>
<tr>
<th>General characteristic</th>
<th>Number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>27</td>
<td>45.0</td>
</tr>
<tr>
<td>Female</td>
<td>33</td>
<td>55.0</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;50</td>
<td>15</td>
<td>25.0</td>
</tr>
<tr>
<td>50-59</td>
<td>12</td>
<td>20.0</td>
</tr>
<tr>
<td>60-69</td>
<td>11</td>
<td>18.3</td>
</tr>
<tr>
<td>≥70</td>
<td>22</td>
<td>36.7</td>
</tr>
<tr>
<td>Mean ± SD = 62.3 ± 14.7 Range = 33-93</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>8</td>
<td>13.3</td>
</tr>
<tr>
<td>Married</td>
<td>38</td>
<td>63.4</td>
</tr>
<tr>
<td>Widowed/separated</td>
<td>14</td>
<td>23.3</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elementary or lower</td>
<td>31</td>
<td>51.7</td>
</tr>
<tr>
<td>Secondary</td>
<td>11</td>
<td>18.3</td>
</tr>
<tr>
<td>Diploma/bachelor or higher</td>
<td>18</td>
<td>30.0</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Housewife/unemployed</td>
<td>32</td>
<td>53.3</td>
</tr>
<tr>
<td>Self-employed</td>
<td>15</td>
<td>25.0</td>
</tr>
<tr>
<td>Government officer</td>
<td>4</td>
<td>6.7</td>
</tr>
<tr>
<td>Farmer/laborer/other</td>
<td>9</td>
<td>15.0</td>
</tr>
<tr>
<td><strong>Family income (baht)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤30,000</td>
<td>22</td>
<td>36.7</td>
</tr>
<tr>
<td>30,001-50,000</td>
<td>26</td>
<td>43.3</td>
</tr>
<tr>
<td>≥50,001-100,000</td>
<td>12</td>
<td>20.0</td>
</tr>
<tr>
<td>Median = 25,550 baht(^a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range = 4,000-300,000 baht</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Payment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-paid</td>
<td>40</td>
<td>66.7</td>
</tr>
<tr>
<td>Reimbursed</td>
<td>20</td>
<td>33.3</td>
</tr>
</tbody>
</table>

**Note:** \(^a\)30 baht = 1 US$

<table>
<thead>
<tr>
<th>Variable</th>
<th>Before</th>
<th>After</th>
<th>(p)-value(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall patient satisfaction</td>
<td>36.0</td>
<td>40.3</td>
<td>0.003</td>
</tr>
<tr>
<td>Provider</td>
<td>11.3</td>
<td>12.6</td>
<td>0.002</td>
</tr>
<tr>
<td>Medicine and equipment</td>
<td>10.5</td>
<td>12.4</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Continuity of care</td>
<td>14.2</td>
<td>15.3</td>
<td>0.074</td>
</tr>
</tbody>
</table>

**Notes:** \(^a\)By paired \(t\)-test; \(n = 50\)
Complications from hemodialysis
The prevalence of hypotension due to hemodialysis at three months post-implementation of KM (2009) had significantly decreased compared with three months before implementing KM (in 2008) (8.23 vs 16.66 percent; \( p < 0.001 \)) (Table V).

Discussion
In this study, the implementation of KM focused more on personal assets and subjective knowledge, which were “tacit knowledge” and knowledge sharing, rather than IT or advanced technologies. By the end of the implementation phase, team members were more at ease in sharing their thoughts and empowered to do something new. During the KM work was done or followed up on, there were regular staff monthly meetings. The KM team shared their knowledge and initiated new practices to other staff in the meetings. For example, setting up “kidney lover group” where the staff invited hemodialysis patients to join and share their knowledge and experiences. “Double-loop learning” (thinking outside the box to change the rules) was practiced, and they developed new unit guideline for staff assignments, reviewed the unit’s productivity record and some work instructions. This could be considered as part of the intervention results in transforming “tacit knowledge” into “explicit knowledge”. About 80 percent of the implementation process was consistent with the plan. Success with implementation of the KM model may be attributable to management support for the quality improvement program and staff participation; these may be organizational prerequisites for the implementation of KM (Spencer et al., 2003).

Table V.
Prevalence of complications per episode of hemodialysis, three months before, and at three and six months post-applying KM to daily work

<table>
<thead>
<tr>
<th>Complication</th>
<th>3 months before(^a)</th>
<th>3 months after(^b)</th>
<th>( p)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( n )</td>
<td>( % )</td>
<td>( n )</td>
</tr>
<tr>
<td>Hypotension</td>
<td>418</td>
<td>16.66</td>
<td>192</td>
</tr>
<tr>
<td>Cramp</td>
<td>112</td>
<td>3.85</td>
<td>76</td>
</tr>
<tr>
<td>Infection</td>
<td>1</td>
<td>0.03</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: \(^a332\) patients with 2,989 episodes of hemodialysis, August-October 2008; \(^b256\) patients with 2,333 episodes of hemodialysis, August-October 2009; \(^c\)\( p\)-value by Chi-square; \(^d\)\( p\)-value by Fisher’s Exact Test
Overall staff job satisfaction increased significantly after implementing KM ($p < 0.001$). These changes may have been due to the KM process of enhancing interpersonal relationships and trust among team members, as well as learning and sharing experiences among staff, which promote recognition and responsibility, key motivational factors for job satisfaction (Herzberg et al., 1959). During the implementation of KM, the staff were also encouraged to look for new alternatives, learn from experts, and collaborate with a multidisciplinary team. Although the workloads and the work environment remained the same, new perceptions and new ways of assigning duties and responsibilities, derived from the KM model, might result in better attitudes and job performance. The results are consistent with Herzberg’s two-factor theory (Kaldenberg and Regrut, 1999), i.e. the hygiene and motivation dimensions of job satisfaction. When motivational factors are improved, job satisfaction is higher.

Implementation of the KM model in the hemodialysis unit resulted in higher levels of patient satisfaction, as the patients perceived service improvements. Overall patient satisfaction with services increased significantly ($p = 0.003$). A direct correlation between staff satisfaction and patient satisfaction is well accepted (Chaoprasert and Elsey, 2004). A study of service-quality improvement in the Thai retail banking industry showed that service quality was a key factor in consumer satisfaction (Chaoprasert and Elsey, 2004). The results also agreed with the study by Ammentorp et al. (2005) which identified key elements of patient satisfaction with nurses’ behavior and physicians’ performance. Another study on patient satisfaction reported that indicators for patient satisfaction were effectiveness, comprehensiveness of care, and caring behaviors (Cole et al., 1999). The study by Agosta (2009) indicated that patient satisfaction was highly connected with communication and interaction between nurses and patients. Orzano et al. (2008) suggested that to excel at delivering care, the creation and sharing of knowledge may need to occur not only between doctor and patient, but also throughout the practice, and possibly between the practice and other health-system participants. Improvements in quality of care can improve patient satisfaction. Improvements using the KM process might be a new approach to encouraging better relationships among staff, nephrologists, and patients. The KM process promoted greater dialogue, group discussion, and personal contact. Once the patients felt that they received appropriate attention from their doctors and nurses, their satisfaction increased. Leadership of the hospital top management is important for quality improvement as it can help to empower the unit staff and make change to the hemodialysis unit to accept the new guidelines according to the best practice from knowledge sharing. The Head of Hemodialysis Unit including the two nephrologists were also convinced by the top management of the hospital as it is rather difficult to encourage specialists to follow the KM process which they are not familiar with. It can be concluded that the successful of KM process in this study was due to the management support and collaboration between staff and multidisciplinary heath care team.

The long study period (ten months) probably affected patients’ QoL, and a decline in health could be expected. Moreover, the sample group had a mean age of 62.3 years, and all underwent dialysis twice a week. The result of this study differed from several other studies suggesting hemodialysis-patient QoL declined over time (Krairittichai et al., 2006; Wight et al., 1998; Fiebiger et al., 2004; Fukuhara et al., 2008). Three domains of patient QoL – role-physical, role-emotional, and vitality – increased
significantly ($p < 0.05$), all of which were related to patients’ activities. Although these patients did not improve in all domains, they perceived improved physical and emotional status, which helped them cope with their daily activities and social function. This result confirmed the findings of Fukuhara et al. (2003) who studied health-related QoL among dialysis patients on three continents, and found that Japanese hemodialysis patients functioned better physically than patients from the US or Europe.

Concerning complications, the prevalence of hypotension during hemodialysis decreased significantly after implementing KM ($p < 0.001$), and cramps decreased slightly. However, the rate of infection at the graft site did not change. This result supported the improvement of quality of care and patient self-care.

This study had the following major limitations:

- it was conducted in a hemodialysis unit of a non-profit private hospital in Bangkok; therefore, the results might not be generalized to all hemodialysis units, public or private;
- the patient drop-out rate was rather high due to the long study period (ten months);
- the launch of the government’s policy of free dialysis, which coincided with the start of the study, caused several patients to move out, which was not controllable; and
- this study was not a randomized controlled trial design, it is important to remember that the results could be explained by factors other than the intervention.

Although our proposed KM model needs refinement and testing for generalization, the experiences gained from applying KM for quality improvement in the hemodialysis unit has been used as a case study in teaching the KM session of a six-month training course for nurse practitioner on renal replacement therapy (hemodialysis). This practitioner training course was organized twice a year by a non-profit private hospital, with 40 nurses per batch from different hospitals. In addition, the clinical aspects based on the results of this study will be published in *Journal of the Nephrology Society of Thailand*.

**Conclusions**

After implementing the KM model in the hemodialysis unit, staff job satisfaction and patient satisfaction with services improved significantly. Three domains of patient QoL – role limitations due to physical and emotional problems, and vitality – at three and six months post-implementation of KM, increased significantly. The rate of hypotension per episode of hemodialysis also decreased.

**References**


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