Original article

Socio-clinical factors associated with self-care self-efficacy in postoperative patients with Kehr T-tube drainage: A cross-sectional study

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Abstract

Background: Patients discharged with a Kehr T-tube after biliary surgery must perform complex self-care activities to prevent complications and support recovery. This study aimed to assess self-care self-efficacy and examine sociodemographic and clinical factors associated with self-care self-efficacy among postoperative patients with Kehr T-tube drainage.

Materials and Methods: A cross-sectional study was conducted among 120 postoperative patients with Kehr T-tube drainage at Hue University of Medicine and Pharmacy Hospital, Vietnam. Self-care self-efficacy was assessed using the Self-Care Self-Efficacy Scale. Group differences were analyzed using the Mann-Whitney U and Kruskal-Wallis H tests. Variables significant in bivariate analyses were entered into a multiple linear regression model to identify independent determinants. Statistical significance was set at $p < 0.05$.

Results: The mean overall self-care self-efficacy score was 3.42 ± 0.66. Among the four domains, self-efficacy based on clinical knowledge had the highest mean score. Bivariate analyses showed significant differences in overall self-care self-efficacy according to age, educational level, occupation, and primary caregiver during hospitalization and after discharge ($p < 0.05$). In the multiple linear regression model, secondary/high school education ($\beta = 0.29$, $p = 0.01$), graduate/postgraduate education ($\beta = 0.34$, $p = 0.001$), and primary caregiver after discharge ($\beta = -0.30$, $p = 0.04$) were independently associated with self-care self-efficacy. The final model explained 28.8% of the variance (adjusted $R^2 = 0.243$; $F(7,112) = 6.464$, $p < 0.001$).

Conclusion: Postoperative patients with Kehr T-tube drainage had a mean self-care self-efficacy score of 3.42 ± 0.66, with lower confidence in self-care monitoring and management than in clinical knowledge. Educational attainment and primary caregiver after discharge were independently associated with self-care self-efficacy. These findings support individualized discharge education and caregiver-inclusive postoperative support.

Keywords: *gallstone disease; Kehr T-tube drainage; self-care self-efficacy; discharge education; caregiver support; postoperative care; nursing.*

1. INTRODUCTION

Gallstone disease is one of the most common gastrointestinal disorders worldwide. Common bile duct (CBD) stones occur in approximately 10% – 20% of patients with gallstone disease and may lead to serious complications, including acute cholangitis, obstructive jaundice, and acute pancreatitis if not appropriately treated [1, 2]. Advances in minimally invasive biliary surgery have substantially reduced the routine use of Kehr T-tube drainage following CBD exploration [3]. Nevertheless, T-tube drainage remains clinically relevant for selected patients with complex biliary conditions, including difficult or residual CBD stones, biliary strictures, biliary tumors, and cases requiring biliary tract reconstruction. In these circumstances, T-tube placement provides external biliary drainage and decompression, facilitates postoperative cholangiography, and may reduce the risk of biliary obstruction and leakage [4].

A particular challenge associated with T-tube drainage is that postoperative management often extends beyond hospitalization. T-tubes are generally removed after adequate maturation of the sinus tract, commonly several weeks after surgery; in patients with residual CBD stones or persistent biliary abnormalities, drainage may need to be maintained for three months or longer. Because the postoperative hospital stay is considerably shorter than the period of T-tube retention, many patients are discharged while the tube remains in place and must continue its management at home. Home management requires maintaining tube patency,

monitoring the amount and characteristics of bile drainage, protecting the tube from accidental dislodgement, caring for the insertion site, preventing infection, and recognizing warning signs requiring medical attention. These responsibilities can be challenging when patients transition from hospital-based care to self-management at home. Inadequate T-tube management may contribute to tube-related complications, impaired quality of life, and unplanned healthcare utilization [3, 5, 6]. Thus, successful recovery depends not only on surgical management but also on patients' confidence in undertaking postoperative self-care after discharge.

Self-care self-efficacy refers to an individual's confidence in their ability to perform the behaviors required to manage their health condition and is conceptually grounded in Bandura's Social Cognitive Theory [7]. It is distinct from self-care behavior itself: self-care describes what patients do to maintain health, monitor changes, and manage health problems, whereas self-care self-efficacy reflects confidence in performing those behaviors. In postoperative patients discharged with a T-tube, self-care self-efficacy is particularly relevant because patients must undertake technically demanding care activities with less direct professional supervision. Higher self-efficacy has been associated with greater engagement in self-management and adherence to health recommendations across patient populations [5-8].

Self-care self-efficacy vary according to patients' sociodemographic, clinical, and care-related circumstances. Age, educational attainment, employment status, and caregiving arrangements may be associated with patients' confidence in managing health-related tasks [7, 8]. Identifying such factors among patients with Kehr T-tube drainage may support nurses recognize individuals who require more intensive education, skills training, caregiver involvement, or follow-up support. However, evidence on factors associated with self-care self-efficacy in this specific population remains limited. Therefore, this study aimed to assess self-care self-efficacy and examine sociodemographic and clinical factors associated with self-care self-efficacy among postoperative patients with Kehr T-tube drainage.

2. MATERIALS AND METHODS

2.1. Study design and participants

A cross-sectional study was conducted from November 2023 to November 2025 at Hue University of Medicine and Pharmacy Hospital, Hue, Vietnam, to identify self-care self-efficacy and examine sociodemographic and clinical factors associated with it among postoperative patients with Kehr T-tube drainage. Participants were recruited using convenience sampling.

Eligible participants were adults (≥ 18 years) who had undergone surgery with Kehr T-tube drainage for gallstone disease, were clinically stable, able to communicate in Vietnamese, and willing to provide written informed consent. Patients with cognitive impairment, severe postoperative complications that precluded questionnaire completion, or inability to communicate effectively were excluded from the study.

The sample size was estimated a priori using G*Power version 3.1.9.7 for multiple linear regression (F tests; linear multiple regression: fixed model, R^2 deviation from zero) [9]. Based on an anticipated model including seven potential variables associated with self-care self-efficacy, a medium effect size (Cohen's $f^2 = 0.15$), a significance level of 0.05, and a statistical power of 80%, the minimum required sample size was 103 participants. Allowing for approximately 10% incomplete or unusable data, the target sample size was increased to 115 participants. A total of 120 participants were recruited and included in the study.

2.2. Study instrument

Data were collected using a structured questionnaire consisting of two sections. The first section collected sociodemographic and available clinical information, including age, gender, ethnicity, residential area, educational level, occupation, marital status, economic status, health insurance status, smoking history, alcohol use, primary caregiver during hospitalization, primary caregiver after discharge, and presence of chronic illness. These variables were selected as potential factors associated with self-care self-efficacy based on the study framework and previous literature. Detailed T-tube-related clinical characteristics, such as duration of T-tube placement, postoperative pain, and length of hospital stay, were not included in the current dataset and are acknowledged as a limitation.

Self-care self-efficacy was assessed using the Self-Care Self-Efficacy Scale (SCSES) developed by Yu et al. [10]. The 10-item SCSES is a self-report measure of confidence in performing self-care activities and demonstrated high internal consistency in the original multinational validation study. The instrument was translated from English into Vietnamese using a forward- and back-translation process informed by

cross-cultural adaptation guidance [11]. The present study used the four-domain structure reported by Chica-Pérez et al. [12]: self-efficacy based on clinical knowledge (3 items), self-efficacy in self-care maintenance (2 items), self-efficacy in self-care monitoring (3 items), and self-efficacy in self-care management (2 items). Each item is rated from 1 (not confident at all) to 5 (very confident). Domain and overall scores were calculated as the mean of the corresponding items; higher scores indicate greater self-care self-efficacy. A pilot study involving 15 postoperative patients with Kehr T-tube drainage demonstrated good internal consistency for the Vietnamese version (Cronbach's $\alpha = 0.86$). Because the SCSES does not provide a validated diagnostic cut-off for low, moderate, or high self-efficacy, scores were analyzed as continuous measures rather than formally classified using an arbitrary cut-off.

2.3. Data analysis

Data were analyzed using IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize participant characteristics and study variables. Continuous variables were presented as means, standard deviations (SD), and categorical variables were expressed as frequencies and percentages. Normality was assessed using the Kolmogorov-Smirnov and Shapiro-Wilk tests. As the outcome variables were not normally distributed, the Mann-Whitney U test and Kruskal-Wallis H test were used for bivariate analyses. Multiple linear regression model was used to identify factors independently associated with self-care self-efficacy. Statistical significance was set at $p < 0.05$.

2.4. Ethics statement

The study was approved by the Research Ethics Committee of Hue University of Medicine and Pharmacy, Hue University (Approval number: H2024/533, dated August 19, 2024), and permission to collect data was obtained from Hue University of Medicine and Pharmacy Hospital. All participants received written and verbal information about the study objectives, procedures, potential risks, and benefits before enrollment. Written informed consent was obtained from all participants. Participation was voluntary, confidentiality and anonymity were ensured, and participants were informed that they could withdraw from the study at any time without affecting their medical care.

2.5. Data collection procedure

Eligible participants were recruited after providing informed consent. Questionnaires were completed during the postoperative hospitalization before discharge, when participants were clinically stable. Standardized instructions were provided, and the researcher clarified questionnaire items when necessary without influencing responses. The data collector did not provide T-tube self-care education as part of questionnaire administration. Questionnaire completion required approximately 30 – 45 minutes, and completed forms were reviewed for missing responses.

3. RESULTS

A total of 120 participants were included in the study. Nearly half of the participants were aged 40 – 60 years (49.2%), followed by those aged ≥ 60 years (30.0%) and < 40 years (20.8%). The majority were female (69.2%) and belonged to the Kinh ethnic group (98.3%). Most participants lived in urban areas (67.5%). Regarding educational attainment, over half of the participants had completed secondary or high school education (51.7%), while 36.7% had primary school education or were illiterate, and 11.7% had a graduate or postgraduate degree. Approximately two-thirds of the participants were employed (64.2%), and the vast majority were married (94.2%).

Most participants reported a middle-income or above economic status (89.2%) and had health insurance coverage (87.5%). Regarding health-related behaviors, 28.3% had a history of smoking, whereas 52.5% reported a history of alcohol use. During hospitalization, the primary caregiver was most commonly the spouse (69.2%), with family members accounting for 30.8% of caregivers. Similarly, after discharge, spouses remained the primary caregivers for 63.3% of participants, while 36.7% were primarily cared for by other family members. Finally, 18.3% of participants reported having at least one chronic illness, whereas the majority (81.7%) did not.

Table 1. Characteristics of study participants (n = 120)

Variable		N	%
Age	< 40	25	20.8
	40 - 60	59	49.2
	≥ 60	36	30.0

Gender	Male	37	30.8
	Female	83	69.2
Ethnicity	Kinh	118	98.3
	Other	2	1.7
Living area	Rural area	39	32.5
	Urban area	81	67.5
Educational level	Illiterate/ Primary school	44	36.7
	Secondary/ High school	62	51.7
	Graduate/Postgraduate degree	14	11.7
Occupation	Retired/Unemployed	43	35.8
	Employed	77	64.2
Marital status	Married	113	94.2
	Single/Divorced/Separated	7	5.8
Economic status	Poor or near-poor household	13	10.8
	Middle-income and above households	107	89.2
Health insurance status	Yes	105	87.5
	No	15	12.5
Smoking history	Yes	34	28.3
	No	86	71.7
Alcohol use	Yes	63	52.5
	No	57	47.5
Primary caregiver during hospitalization	Spouse	83	69.2
	Family member	37	30.8
Primary caregiver after discharge	Spouse	76	63.3
	Family member	44	36.7
Having a chronic illness	Yes	22	18.3
	No	98	81.7

The overall mean self-care self-efficacy score was 3.42 ± 0.66 (range, 1.60 – 5.00) (Table 2). Among the four domains, self-efficacy based on clinical knowledge had the highest mean score (3.76 ± 0.76), followed by self-efficacy in self-care maintenance (3.59 ± 0.83). Lower scores were observed for self-efficacy in self-care monitoring (3.15 ± 0.78) and self-efficacy in self-care management (3.13 ± 0.75).

Table 2. Self-care self-efficacy scores of participants (n=120)

Variables	Mean±SD	Min	Max
Self-Care Self-Efficacy	3.42±0.66	1.60	5.00
Self-efficacy based on clinical knowledge	3.76 ± 0.76	1.67	5.00
Self-efficacy in self-care maintenance	3.59± 0.83	1.00	5.00
Self-efficacy in self-care monitoring	3.15± 0.78	1.00	5.00
Self-efficacy in self-care management	3.13± 0.75	1.50	5.00

Bivariate analyses showed statistically significant differences in overall self-care self-efficacy according to age (p = 0.02), educational level (p < 0.001), occupation (p = 0.001), primary caregiver during hospitalization (p = 0.01), and primary caregiver after discharge (p < 0.001) (Table 3). Age was also associated with self-

efficacy in self-care maintenance, monitoring, and management. Educational level was associated with all four self-care self-efficacy domains. Participants with graduate/postgraduate education had the highest mean ranks, whereas those who were illiterate or had primary school education generally had the lowest ranks. Employed participants also had higher mean ranks than retired/unemployed participants across all domains and the overall score.

Caregiver category was associated with several self-care self-efficacy outcomes. Participants with a spouse as the primary caregiver during hospitalization had higher mean ranks for clinical knowledge, self-care maintenance, self-care monitoring, and overall self-care self-efficacy than those cared for by other family members. After discharge, participants with a spouse as the primary caregiver also had higher unadjusted mean ranks across all four domains and the overall score. These bivariate findings should be interpreted separately from the adjusted regression coefficient in Table 4, whose direction depends on the coding and reference category used for the caregiver variable.

Alcohol use was associated only with self-efficacy in self-care monitoring ($p = 0.04$), and living area was associated only with self-efficacy in self-care management ($p = 0.046$). No statistically significant differences in the overall self-care self-efficacy score were observed by gender, ethnicity, living area, marital status, economic status, health insurance status, smoking history, alcohol use, or chronic illness (all $p > 0.05$).

Table 3. Self-care self-efficacy according to participant characteristics (n = 120)

Variable	Self-efficacy based on clinical knowledge		Self-efficacy in self-care maintenance		Self-efficacy in self-care monitoring		Self-efficacy in self-care management		Self-Care Self-Efficacy	
	Mean rank	p	Mean rank	p	Mean rank	p	Mean rank	p	Mean rank	p
Age										
< 40	67.62	0.06	67.46	0.01	75.58	0.02	69.44	0.03	70.12	0.02
40-60	64.47		66.49		59.79		64.27		64.23	
≥ 60	49.06		45.85		51.19		48.11		47.71	
Gender										
Female	59.90	0.78	57.20	0.11	58.93	0.45	58.98	0.46	58.45	0.33
Male	61.84		67.91		64.03		63.91		65.09	
Ethnicity										
Kinh	60.42	0.84	61.17	0.1	60.85	0.39	60.74	0.56	60.82	0.44
Other	48.75		44.25		39.75		56.50		41.50	
Living area										
Rural area	56.72	0.40	55.12	0.23	55.29	0.25	51.60	0.046	53.88	0.15
Urban area	62.32		63.09		63.01		64.78		63.69	
Educational level										
Illiterate/ Primary school	44.14	< 0.001	47.97	0.01	43.34	< 0.001	43.11	< 0.001	41.76	< 0.001
Secondary/ High school	68.44		65.99		65.46		65.35		67.24	
Graduate/ Postgraduate degree	76.75		75.57		92.46		93.68		89.54	
Occupation										
Retired/Unemployed	47.99	0.003	48.98	0.006	47.67	0.002	49.51	0.008	46.37	0.001
Employed	67.49		66.94		67.66		66.64		68.39	

Variable	Self-efficacy based on clinical knowledge		Self-efficacy in self-care maintenance		Self-efficacy in self-care monitoring		Self-efficacy in self-care management		Self-Care Self-Efficacy	
Marital status										
Married	60.23	0.73	60.10	0.60	59.64	0.27	59.82	0.38	60.04	0.56
Single/Divorced/ Separated	64.86		67.00		74.36		71.43		67.86	
Economic status										
Poor or near poor household	53.35	0.43	56.92	0.69	46.27	0.12	45.31	0.09	50.15	0.25
Middle income and above households	61.37		60.93		62.23		62.35		61.76	
Health insurance status										
Yes	59.91	0.62	60.77	0.82	58.94	0.19	58.27	0.06	59.27	0.31
No	64.63		58.60		71.40		76.13		69.10	
Smoking history										
Yes	58.57	0.70	64.03	0.48	66.62	0.22	62.96	0.62	64.00	0.49
No	61.26		59.10		58.08		59.53		59.12	
Alcohol use										
Yes	63.12	0.38	65.50	0.09	66.79	0.04	63.94	0.24	65.90	0.07
No	57.61		54.97		53.54		56.69		54.53	
Primary caregiver during hospitalization		0.01		0.05		0.048		0.14		0.01
Spouse	66.31		64.52		64.64		63.59		65.98	
Family member	47.46		51.47		51.20		53.57		48.20	
Primary caregiver after discharge		< 0.001		0.002		0.002		0.02		< 0.001
Spouse	70.60		67.72		67.98		66.20		69.89	
Family member	43.06		48.03		47.58		50.65		44.27	
Having a chronic illness										
Yes	60.31	0.89	59.84	0.65	57.95	0.09	58.67	0.21	58.88	0.28
No	61.34		63.45		71.86		68.66		67.70	

Multiple linear regression analysis was performed to identify factors independently associated with sel care self efficacy. The overall regression model was statistically significant, $F(7,112) = 6.464$, $p < 0.001$, explaining 28.8% of the variance in self-care self-efficacy ($R^2 = 0.288$; adjusted $R^2 = 0.243$). After adjustment for the other variables included in the model, educational level was significantly associated with self-care self-efficacy. Compared with participants who were illiterate or had completed only primary school, those with secondary/high school education had higher self-care self-efficacy scores ($B = 0.39$, $\beta = 0.29$, $p = 0.01$), as did those with graduate/postgraduate education ($B = 0.69$, $\beta = 0.34$, $p = 0.001$).

Primary caregiver after discharge was also significantly associated with self-care self-efficacy. Compared with participants cared for by other family members, those whose primary caregiver after discharge was their spouse had lower self-care self-efficacy scores ($B = -0.41$, $\beta = -0.30$, $p = 0.04$). In contrast, age group, employment status, and primary caregiver during hospitalization were not significantly associated with self-care self-efficacy after adjustment for the other variables in the model (all $p > 0.05$). VIF values ranged from 1.50 to 3.25, indicating no evidence of substantial multicollinearity among the variables included in the model.

Table 4. Multiple linear regression analysis of factors associated with self care self efficacy (n = 120)

Variables	B	SE	β	t	p	VIF
Age Group (Ref: age > 60 years)						
Age (40 – 60 years)	0.21	0.13	0.16	1.66	0.09	1.50
Age (< 40 years)	0.25	0.17	0.16	1.50	0.14	1.72
Educational Level (Ref: Illiterate/Primary school)						
Educational level (Secondary/High school)	0.39	0.14	0.29	2.71	0.01	1.85
Educational level (Graduate/Postgraduate)	0.69	0.20	0.34	3.46	0.001	1.50
Employment Status (Ref: Retired/Unemployed)						
Employed	0.10	0.14	0.07	0.72	0.48	1.52
Primary caregiver During Hospitalization (Ref: Other family members)						
Spouse	0.32	0.19	0.22	1.63	0.11	2.92
Primary caregiver After Discharge (Ref: Other family members)						
Spouse	-0.41	0.20	-0.30	-2.11	0.04	3.25

$R^2 = 0.288$; Adjusted $R^2 = 0.243$; $F(7,112) = 6.464$; $p < 0.001$; Durbin–Watson = 1.650.

4. DISCUSSION

This study assessed self-care self-efficacy and examined associated sociodemographic and clinical factors among postoperative patients with Kehr T-tube drainage. The overall mean self-care self-efficacy score was 3.42 ± 0.66. Among the four dimensions, clinical knowledge had the highest score, whereas self-care monitoring and management had lower scores. This pattern suggests that patients may have greater confidence in their knowledge of T-tube care than in their ability to monitor their condition, make care-related decisions, and manage problems independently. Similar variations across self-care self-efficacy domains have been reported in previous studies using the Self-Care Self-Efficacy Scale [10, 12] including United States, China (Hong Kong. Riegel et al. emphasized that effective self-care involves not only knowledge but also confidence in monitoring symptoms, making appropriate decisions, and performing self-management behaviors [8]with a specific emphasis on percutaneous surgeries. A case–control study was conducted in accordance with the EQUATOR-STROBE statement. Over the period of January 2023 to December 2023, a cohort of 146 discharged patients with drainage tubes were recruited. Upon their return to the hospital for the removal of the drainage tubes, an anonymous questionnaire was administered to gather data on various aspects, including basic demographic characteristics, comprehensive disease information, and the respondents' self-nursing intention concerning the drainage tubes. Chi-square tests and binary logistic regression analysis were used to explore the factors associated with self-nursing intention and the degree of influence. Bivariate analysis was conducted to examine the relevance of the variables showing significant differences. Excluding 5 questionnaires (logic errors. These findings highlight the importance of assessing multiple dimensions of self-care self-efficacy rather than focusing solely on patients' knowledge before discharge.

In the multivariable analysis, educational level and primary caregiver after discharge remained significantly associated with self-care self-efficacy. Participants with secondary/high school and graduate/postgraduate education had higher self-care self-efficacy scores than those with primary education or no formal education. This finding is consistent with previous evidence showing an association between educational attainment and self-care self-efficacy [12]. Higher educational attainment may facilitate comprehension of health information and discharge instructions and may support patients in recognizing warning signs and making informed care-related decisions. However, because of the cross-sectional design, these findings should be interpreted as associations rather than evidence that educational attainment determines self-care self-efficacy. From a clinical perspective, patients with limited educational backgrounds may benefit from discharge education using plain language, visual materials, demonstrations, and teach-back approaches.

Primary caregiver after discharge was also significantly associated with self-care self-efficacy. This finding highlights the potential relevance of family support during the transition from hospital to home, particularly for patients who are discharged with a Kehr T-tube and are required to perform ongoing self-care. Previous studies have shown that caregiver preparedness and caregiver self-efficacy are associated with patients' self-management behaviors and health outcomes [13, 14]. Family caregivers may support patients by reinforcing discharge instructions, assisting with T-tube care, monitoring for warning signs, and providing emotional and practical support. Accordingly, discharge planning for patients with a Kehr T-tube should consider involving primary caregivers in education and practical skill training.

Age and occupation were significantly associated with self-care self-efficacy in the bivariate analyses but were no longer statistically significant after adjustment for other variables. Other sociodemographic and clinical characteristics, including gender, ethnicity, marital status, economic status, health insurance status, smoking, alcohol use, and chronic illness, were also not independently associated with self-care self-efficacy in the multivariable model. These results indicate that the associations observed in the unadjusted analyses may partly reflect relationships among the included variables.

Several limitations should be acknowledged. First, the cross-sectional design precludes causal or temporal conclusions regarding factors associated with self-care self-efficacy. Second, participants were recruited from a single hospital using convenience sampling, which may limit generalizability. Third, the analysis included limited T-tube-specific clinical characteristics and did not account for potentially relevant factors such as postoperative pain, length of hospitalization, duration of T-tube placement at assessment, previous experience with T-tube care, or the amount and method of discharge education. Fourth, the manuscript dataset does not document whether all participants received a standardized number of T-tube education sessions or competency assessment before questionnaire completion. Future multicenter longitudinal studies should incorporate these clinical and educational variables and assess changes in self-care self-efficacy across the transition from hospital to home.

5. CONCLUSION

Postoperative patients with Kehr T-tube drainage had an overall mean self-care self-efficacy score of 3.42 ± 0.66, with higher confidence in clinical knowledge than in self-care monitoring and management. Educational attainment and primary caregiver after discharge were independently associated with the overall score, although the direction of the caregiver association requires confirmation against the original variable coding. These findings support individualized discharge education and caregiver-inclusive care, particularly for patients who may need additional support to develop confidence in T-tube self-care. Longitudinal studies incorporating T-tube-specific clinical and educational characteristics are needed to clarify how self-care self-efficacy develops after discharge.

Conflict of Interest Statement: The authors declare that there are no conflicts of interest regarding the publication of this article.

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