Medication self-management and the quality of discharge education among parents of children with epilepsy

Hyun Jie Lee [a], Eun Kyoung Choi [b],[*], Hee Soon Kim [b], Hoon Chul Kang [c],[d]

[a] *Severance Children's Hospital, Yonsei University College of Nursing, Seoul, Republic of Korea*
[b] *Mo-Im Kim Nursing Research Institute, Yonsei University College of Nursing, Seoul, Republic of Korea*
[c] *Division of Pediatric Neurology, Department of Pediatrics, Pediatric Epilepsy Clinics, Severance Children's Hospital, Yonsei University College of Medicine, Seoul, Republic of Korea*
[d] *Epilepsy Research Institute, Yonsei University College of Medicine, Seoul, Republic of Korea*

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ABSTRACT

Introduction: Medication self-management is critical among children with epilepsy. In the present study, we aimed to investigate the perceptions regarding the quality of discharge education among parents of children with epilepsy. In addition, we assessed the impact of their perceptions on medication self-management. The quality of discharge education was assessed in two parts: content and delivery. The quality of delivery was defined as the manner in which nurses teach the content regarding hospital discharge.
Methods: Forty-seven parents of children with epilepsy completed the questionnaires regarding demographics, the quality of discharge education, and medication self-management (the Quality of Discharge Teaching Scale and the Pediatric Epilepsy Medication Self-Management Questionnaire).
Results: Parent-reported quality of discharge education was positively correlated with medication self-management ($r = 0.305$; p = .037). Parent-reported quality of delivery, but not the amount of content, was positively correlated with medication self-management ($r = 0.347$; p = .017).
Conclusions: These data suggest that efforts to improve medication self-management among children with epilepsy should include strategies to develop teaching skills among nurses delivering the discharge education.

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1. Introduction

Self-management refers to "the interaction of health behaviors and related processes that patients and families engage in to care for a chronic condition" [1]. According to the pediatric self-management model [1], self-management behaviors occur within the domains of the individual, family, community, and healthcare system. Modifiable or nonmodifiable factors, which influence each domain specially, affect self-management through basic cognitive, emotional, and social processes. The extent to which self-managing behavior can affect adherence, and the ultimate results, can change self-managing behavior. Notably, adherence is relatively low in children with chronic conditions. For example, adherence rates range from 31.9 to 79.4% in children with epilepsy [2–8]. Medication routines and seizure care can be complex; therefore, children with epilepsy may struggle with appropriate self-management, depending on their level of intelligence/maturity [9]. Approximately 70% of children with epilepsy exhibit neurodevelopmental

delays [10]. This highlights a key parental role in the management of their health [11].

Antiepileptic drugs (AEDs) represent the therapy of choice for individuals with epilepsy [12]. Approximately 70% of the people taking AEDs remain seizure-free [13]. Antiepileptic drugs may be discontinued when patients have remained seizure-free for at least 2 years [14]. However, it is important for patients to take AEDs as prescribed, as irregular treatment can lead to an increase in the number of seizures [15], improper treatment plan changes [16], and reduced quality of life [17]. Therefore, it is necessary to examine factors that affect at-home medication self-management in children with epilepsy.

Self-management interventions in pediatric epilepsy tend to have a positive impact on at least one outcome (individual, family, health system, community, and process) [18]. Previous studies have demonstrated that family-centered care improves self-management. Family-centered care is based on information sharing, respecting and honoring differences, partnership and collaboration, and negotiation and care in the context of family and community [19]. Medication self-management in children is influenced by the relationship between parents and healthcare providers, which can be improved through adequate medication, education, and communication [20–22]. Indeed, including parents in the intervention process

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* Corresponding author at: Yonsei University College of Nursing, 607 ho, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea.
E-mail address: ekchoi@yuhs.ac (E.K. Choi).

improves medication self-management and maximizes the efficacy of interventions in pediatric patients [23]. Additional studies have demonstrated that educational interventions targeting the families of children with epilepsy are effective in enhancing medication self-management [24,25].

These findings suggest that discharge education can be used to promote medication self-management. Discharge education is the final step in the process of transition from hospital- to home-based care and is a key factor in preparing for discharge [26]. In addition, it is critical to ensure that parents feel confident in managing their child's health at home as part of the preparation for discharge [27]. Previous studies have demonstrated that discharge education lowers rehospitalizations, emergency room visits, and symptoms [28,29], which are all considered outcomes of self-management at home. In general, discharge education includes medication information, such as adverse effects, dosage, and storage information. Therefore, it operates as an educational intervention for medication self-management. However, to the best of our knowledge, no previous studies have investigated the relationship between discharge education and medication self-management in children with epilepsy. Therefore, in the present study, we aimed to identify the perceptions regarding the quality of discharge education among parents of children with epilepsy and their medication self-management. In addition, we assessed the difference in discharge education quality and medication self-management according to the parents and their children's characteristics. Finally, we aimed to establish a more effective strategy for promoting medication self-management in children with epilepsy by identifying the relationship between the quality of discharge education and medication self-management as perceived by their parents.

2. Materials and methods

2.1. Participants and procedure

The present study included a convenience sample of parents whose children had been hospitalized in the neurologic unit at Severance Children's Hospital (South Korea). All included parents had children under the age of 18 who had been hospitalized for epilepsy within the preceding 4 weeks, discharged from the hospital to home, and whose main therapy consisted of AEDs. Additional inclusion criteria were as follows: understanding of the study's purpose and agreement to participate, ability to communicate in Korean, and ability to complete online questionnaires. Parents were excluded if their children had undergone any surgery or followed a ketogenic diet, were admitted to hospital for evaluation only, or could take medication without supervision.

Our study was reviewed and approved by the Institutional Review Board (IRB) at Severance Hospital. The survey was conducted in the pediatric neurology unit and outpatient clinic of our institution from March 22nd to June 10th, 2018. At the unit, researchers provided participants with information regarding the purpose of the study privately on the day before discharge from the hospital, at which time participants provided written informed consent. Following this, questionnaires were distributed to the participants in the hospital. Two weeks after discharge, we confirmed the consent of each participant via telephone. Next, we conducted an online survey of medication self-management (https://goo.gl/forms/FvZdzIO09K0tc36G2). In the outpatient clinic, researchers explained the study to any participants whose children had been discharged within the preceding 2–4 weeks, after which, informed consent was obtained in the clinic and questionnaires were distributed. Participants answered the questionnaires regarding discharge education and medication self-management by recalling discharge education from previous experiences.

Among the 70 parents we approached, 7 declined due to lack of interest or time, resulting in a participation rate of 90%. One participant withdrew; 1 did not meet the inclusion criteria; and 14 never returned the online questionnaire. Thus, the final sample included 47 parents of children with epilepsy (inpatient, n = 32; outpatient, n = 15). There were no statistically significant differences between parents who participated at the unit and those who participated in the outpatient clinic, with the exception of family income, which was higher among outpatient parents ($t = 2.189$, $p = .034$).

2.2. Measures

2.2.1. Quality of Discharge Teaching Scale (QDTS [30])

Parental perception of the quality of discharge education was measured using the QDTS, developed by Weiss et al. [30]. The QDTS is composed of 18 items, 6 of which relate to discharge education, while the remaining 12 relate to methods of content delivery by nurses. Parents rated the level and quality of discharge education on a scale ranging from 0 (none or not at all) to 10 (high amount/quality). Higher scores are considered indicative of higher-quality education. Previous studies have reported that the Cronbach's α for the QDTS was 0.88 in a sample consisting of parents of hospitalized children [30]. With the consent of the developer and translator, we used the validated Korean version of the QDTS, which exhibited high internal consistency in a previous study (Cronbach's α of 0.95 [31]). In this study, Cronbach's α was 0.96.

2.2.2. Pediatric Epilepsy Medication Self-Management Questionnaire (PEMSQ [32])

Medication self-management was assessed using the PEMSQ, a 27-item questionnaire designed for parents of children with epilepsy. The PEMSQ consists of the following four domains: treatment knowledge and expectations, adherence to medications and clinical appointments, beliefs regarding medication efficacy, and barriers to medication adherence. Higher scores are indicative of better medication self-management. Before administering the questionnaire, a researcher and person fluent in both Korean and English translated the PEMSQ into Korean with the permission of the developer. Next, the validity of the translated questionnaire was verified by seven experts, including a pediatric neurologist, nursing professor, pediatric nurse specialist, three heads of pediatric units, and a pediatric nurse who had worked in a pediatric unit for >10 years. The item level content validity (I-CVI) ranged from 0.75 to 1, with a Cronbach's α of 0.83. In addition, according to the definition of drug use defined by Cramer et al. [33], we included several additional questions regarding medication adherence: "Have you forgotten to give medicine to your child after discharge? If yes, how many times have you forgotten to give medicine to your child after discharge?", "Have you ever given your child medicine in the wrong way after discharge? If so, how many times have you ever given the child medicine at the wrong time? How many times have you given the wrong dose of medicine to your child?" We calculated the percentage of children who had not taken the medication or had a history of taking the medication incorrectly as the rate of nonadherence in the overall sample.

2.2.3. General & disease-specific characteristics

Based on a review of the available literature, we examined general characteristics including children's gender/age, major caregiver, and person responsible for medication delivery at home, and children's social activities (assessed by their enrollment in an educational institution). We also evaluated disease characteristics, including diagnosis, age at the time of diagnosis, number of medications, number of AEDs, experience with adverse effect, comorbidities, and parental subjective perceptions of the child's disease severity ("How serious do you think your child's illness is?", 1–5 not severe to excessively severe). We also collected data regarding parent age, education, and income levels.

2.3. Statistical analysis

Survey items were evaluated using descriptive statistical analyses for identifying parents and their children's characteristics, t-tests and one-way analyses of variance for comparing the characteristics of

Table 1
General and disease-specific characteristics (N = 47).

Characteristics	Categories	n	%	Mean ± SD (range)
Parents				
Gender	Male	4	8.5	
	Female	43	91.5	
Age (yr)[a]	20s	4	8.5	35.12 ± 5.83(22–51)
				(Median = 33.00)
	30s	32	68.1	
	40s	6	12.8	
	50s	1	2.1	
Education level[a]	High school	10	22.2	
	College	31	78.9	
	Postgraduate	4	8.9	
Family income[a]	<3000	11	24.4	
(USD)	<4000	17	37.7	
	<5000	6	13.3	
	≥5000	11	24.4	
Children				
Gender	Male	29	61.7	
	Female	18	38.3	
Age (months)				46.43 ± 58.45 (1–216)
				(Median = 17)
Person giving the	Father	1	2.1	
medicine	Mother	40	85.1	
	Grand parents	2	4.3	
	Others	4	8.5	
Disease				
Diagnosis age				26.87 ± 39.48 (1–162)
				(Median = 8)
Number of admission	0	5	10.6	2.19 ± 1.31 (0–4)
in a year				(Median = 2)
	1	11	23.4	
	2	11	23.4	
	≥3	20	42.6	
Comorbidity[a]	No	31	68.9	
	Yes	14	31.1	
Number of AED[b]				2.74 ± 1.60 (1–8)
				(Median = 2)
Experience the adverse	No	9	28.1	
effect of AED[b,a]	Yes	23	71.9	
Perceived disease	Severe	23	49.0	
severity	Moderate	12	25.5	
	Mild	12	25.6	

[a] Excluded nonresponse.
[b] AED = antiepileptic drug.

parents and children, and Pearson correlation coefficients to identify the relationship between quality of discharge education and medication self-management. All analyses were performed using IBM SPSS version 23.0 (IBM, Seoul, Republic of Korea).

3. Results

3.1. Participants

Sample characteristics are presented in Table 1. Among the 47 parents included in the present study, most were female (91.5%). The mean age

of the sample was 35.12 ± 5.83 years (range: 22–51 years). Thirty-five (74.4%) parents had graduated from college, while thirty-four (72.3%) had middle-class income levels. Twenty-nine (61.7%) of their hospitalized children were male, with a mean age of 46.43 ± 58.45 months (range: 1–216 months). Half of the children had experienced AED adverse effects. The average number of AEDs taken by the children was 2.74 ± 1.60 (range: 1–8 drugs). Twenty-three parents (49%) described their child's condition as "severe". The comorbidities included were hypothyroidism, hydrocephalus, cerebral palsy, and congenital heart disease.

3.2. Quality of discharge education

Overall, parents rated the amount of content they received during discharge education as 7.7 out of 10. Similarly, parents provided a 7.7 out of 10 rating regarding the quality of content delivery (Table 2). We observed significant differences in the quality of discharge education with respect to parent age, the number of AEDs, and previous experience with adverse effects of AEDs. Parents of children who were prescribed <3 AEDs had significantly lower scores regarding the amount of content ($t = 2.207$; $p = .032$), and those who did not have adverse effects had a lower content delivery score ($t = 2.278$; $p = .046$) (Table 3).

3.3. Medication self-management

Perfect adherence was reported by 93.7% of the sample, and the mean PEMSQ score was 7.8 out of 10 (Table 2). Higher scores for beliefs regarding medication efficacy were observed when children had one caregiver compared with when they had more than two ($t = 3.589$; $p = .001$). Pediatric Epilepsy Medication Self-Management Questionnaire scores were significantly lower in children taking more than three AEDs when compared with those taking three or fewer AEDs ($t = -2.299$; $p = .029$) (Table 3). Two participants reported that they had forgotten to administer AEDs to their children. One parent had forgotten to administer AEDs four times, and the other had forgotten to administer AEDs once over two weeks. One participant reported that she had administered AEDs to her child in the wrong way for two weeks.

3.4. Relationship between quality of discharge education and medication self-management

We evaluated the correlation between the quality of discharge education and medication self-management (Table 4), observing a significant association between the two ($r = 0.305$; $p = .037$). Specifically, we observed a positive correlation between the delivery of discharge education and medication self-management ($r = 0.34$;, $p = .017$).

4. Discussion

To the best of our knowledge, this is the first study to examine the association between discharge education and medication self-

Table 2
Medication self-management & the quality of discharge education (N = 47).

	Categories (number of items)	Possible range	Actual range	Mean ± SD
Quality of discharge education	Content (6)	0–60	13–60	46.12 ± 12.55
	Delivery (12)	0–120	17–120	92.40 ± 24.87
	Total (18)	0–180	39–180	138.53 ± 36.21
Medication self-management	Disease and treatment knowledge and expectations (8)	8–40	17–35	25.68 ± 4.34
	Adherence to medications & clinical appointments (8)	8–40	27–40	35.48 ± 3.75
		3–15	8–15	12.46 ± 1.95
	Beliefs about medication efficacy (3)	3–15	8–15	12.46 ± 1.95
	Barriers to treatment (8)	8–40	22–39	32.21 ± 4.55
	Total (27)	27–135	82–123	105.85 ± 10.49

Table 3
Differences in the quality of discharge education and medication self-management based on children and parent characteristics (N = 47).

Variables	Categories	N	Quality of discharge education						Medication self-management									
			Content		Delivery		Total		DKTE[a]		AMCA[b]		BME[c]		BT[d]		Total	
			Mean ± SD	t or F(p)	Mean ± SD	t or F(p)	Mean ± SD	t or F(p)	Mean ± SD	t or F(p)	Mean ± SD	t or F(p)	Mean ± SD	t or F(p)	Mean ± SD	t or F(p)	Mean ± SD	t or F(p)
Parents																		
Gender	Male	4	54.00 ± 4.54	1.321	106.25 ± 11.87	1.168	160.25 ± 16.33	1.262	27.75 ± 2.62	.995	36.25 ± 4.50	.420	11.75 ± 1.50	−.765	29.25 ± 3.50	−1.373	105.00 ± 7.87	−.168
	Female	43	45.39 ± 12.83	(NS)	91.11 ± 25.45	(NS)	136.51 ± 36.98	(NS)	25.48 ± 4.44	(NS)	35.41 ± 3.73	(NS)	12.53 ± 1.99	(NS)	32.48 ± 4.57	(NS)	105.93 ± 10.77	(NS)
Age (yr)	**≥33**	**28**	**43.35 ± 12.45**	**−2.229**	**86.32 ± 26.13**	**−2.468**	**129.67 ± 36.92**	**−2.494**	25.14 ± 4.08	−1.629	36.03 ± 3.79	1.084	12.64 ± 2.09	.475	32.42 ± 4.35	.477	106.25 ± 10.93	.052
	<33	**15**	**51.33 ± 8.18**	**(.031)**	**104.40 ± 14.75**	**(.018)**	**155.73 ± 22.17**	**(.017)**	27.26 ± 4.04	(NS)	34.73 ± 3.67	(NS)	12.33 ± 1.91	(NS)	31.73 ± 4.90	(NS)	106.06 ± 11.11	(NS)
Education level	High school	10	51.10 ± 11.46	−1.419	101.30 ± 22.45	−1.249	152.40 ± 33.41	−1.351	25.90 ± 3.98	−.009	34.80 ± 4.58	.678	11.60 ± 2.27	1.580	30.50 ± 6.39	.975	102.80 ± 13.70	1.064
	≥College	35	44.65 ± 12.96	(NS)	90.00 ± 25.92	(NS)	134.65 ± 37.42	(NS)	25.88 ± 4.37	(NS)	35.71 ± 3.51	(NS)	12.68 ± 1.81	(NS)	32.57 ± 3.83	(NS)	106.85 ± 9.65	(NS)
Family income (USD)	≥3000	34	47.67 ± 12.36	1.701	94.67 ± 25.38	1.279	142.35 ± 36.19	1.471	25.88 ± 4.44	.955	35.41 ± 3.61	.315	12.29 ± 2.03	−.374	31.88 ± 4.49	−.807	105.47 ± 10.41	.079
	<3000	11	40.36 ± 12.50	(NS)	83.63 ± 23.11	(NS)	124.00 ± 35.22	(NS)	24.45 ± 3.83	(NS)	35.00 ± 4.26	(NS)	12.54 ± 1.57	(NS)	33.18 ± 5.11	(NS)	105.18 ± 10.82	(NS)
Children																		
Gender	Male	29	46.00 ± 12.37	−.087	90.72 ± 25.55	−.583	136.72 ± 37.35	−.431	25.37 ± 3.53	−.542	34.89 ± 3.45	−1.388	12.31 ± 2.01	−.698	31.58 ± 4.30	−1.203	104.17 ± 10.11	−1.407
	Female	18	46.33 ± 13.20	(NS)	95.11 ± 24.21	(NS)	141.44 ± 35.14	(NS)	26.16 ± 5.49	(NS)	36.44 ± 4.10	(NS)	12.72 ± 1.87	(NS)	33.22 ± 4.88	(NS)	108.55 ± 10.79	(NS)
Diagnosis Age (month)	≥27	16	47.68 ± 11.57	.608	94.43 ± 26.93	.678	142.12 ± 37.74	.704	26.43 ± 4.16	.854	36.56 ± 3.07	1.424	12.43 ± 2.18	−.076	33.50 ± 4.89	1.407	108.93 ± 9.43	1.467
	<27	31	45.32 ± 13.14	(NS)	91.35 ± 24.12	(NS)	136.67 ± 35.88	(NS)	25.29 ± 4.45	(NS)	34.93 ± 3.99	(NS)	12.48 ± 1.85	(NS)	31.54 ± 4.29	(NS)	104.25 ± 10.79	(NS)
	≥42	16	44.43 ± 12.37	−.659	87.31 ± 29.54	−1.008	131.75 ± 41.28	−.921	25.25 ± 4.10	−.484	35.75 ± 3.64	.420	12.50 ± 2.19	.080	33.56 ± 4.44	1.479	107.06 ± 9.69	.565
	<42	31	47.00 ± 12.76	(NS)	95.03 ± 22.16	(NS)	142.03 ± 33.48	(NS)	25.90 ± 4.51	(NS)	35.35 ± 3.86	(NS)	12.45 ± 1.85	(NS)	31.51 ± 4.52	(NS)	105.22 ± 10.98	(NS)
Person responsible for AED[e]	1	43	46.30 ± 12.19	.310	91.67 ± 25.84	−.655	137.97 ± 37.46	−.341	25.51 ± 4.31	−.872	35.51 ± 3.75	.123	12.58 ± 1.84	1.313	32.32 ± 4.62	.553	105.93 ± 10.41	.168
	≥2	4	44.25 ± 18.19	(NS)	100.25 ± 7.04	(NS)	144.50 ± 20.02	(NS)	27.50 ± 5.00	(NS)	35.25 ± 4.27	(NS)	11.25 ± 2.98	(NS)	31.00 ± 4.08	(NS)	105.00 ± 12.98	(NS)
Social activity	Yes	18	43.27 ± 11.60	−1.233	85.38 ± 27.63	−1.546	128.66 ± 38.49	−1.491	24.61 ± 3.29	−1.340	35.94 ± 3.62	.651	12.50 ± 1.94	0.087	32.83 ± 4.91	0.732	105.88 ± 9.36	.019
	No	29	47.89 ± 12.99	(NS)	96.75 ± 22.39	(NS)	144.65 ± 33.95	(NS)	26.34 ± 4.82	(NS)	35.20 ± 3.86	(NS)	12.44 ± 1.99	(NS)	31.82 ± 4.35	(NS)	105.82 ± 11.29	(NS)
Disease																		
Number of admission per year	≥2	31	46.90 ± 12.66	−.169	92.35 ± 26.16	−.019	138.25 ± 37.16	−.071	25.45 ± 4.54	−.499	35.25 ± 3.77	−.584	12.61 ± 2.01	.703	32.19 ± 4.56	−.040	105.51 ± 10.82	−.302
	<2	16	46.56 ± 12.74	(NS)	92.50 ± 22.98	(NS)	139.06 ± 35.46	(NS)	26.12 ± 4.04	(NS)	35.93 ± 3.78	(NS)	12.18 ± 1.86	(NS)	32.25 ± 4.68	(NS)	106.50 ± 10.12	(NS)
Comorbidity	Yes	14	46.00 ± 10.64	.000	92.14 ± 23.15	−.026	138.14 ± 32.93	−.018	25.50 ± 4.76	−.257	35.85 ± 3.39	.321	12.71 ± 2.09	.668	33.42 ± 4.81	1.006	107.50 ± 8.44	.563
	No	31	46.00 ± 13.77	(NS)	92.35 ± 26.61	(NS)	138.35 ± 38.97	(NS)	25.87 ± 4.34	(NS)	35.48 ± 3.70	(NS)	12.29 ± 1.91	(NS)	31.96 ± 4.37	(NS)	105.61 ± 11.14	(NS)
Number of AEDs[e]	**≥3**	**19**	**50.84 ± 9.66**	**2.207**	99.42 ± 17.40	1.621	150.26 ± 6.11	1.879	26.63 ± 3.80	1.242	**33.68 ± 3.97**	**−2.933**	**11.52 ± 1.86**	**−2.939**	**29.68 ± 4.63**	**−3.498**	**101.52 ± 11.87**	**−2.299**
	<3	**28**	**42.92 ± 13.42**	**(.032)**	87.64 ± 28.18	(NS)	130.57 ± 39.97	(NS)	25.03 ± 4.63	(NS)	**36.71 ± 3.10**	**(.005)**	**13.10 ± 1.77**	**(.005)**	**33.92 ± 3.67**	**(.001)**	**108.78 ± 8.44**	**(.029)**
Adverse effect of AEDs[e]	**Yes**	**23**	49.26 ± 8.38	1.312	**98.08 ± 17.45**	**2.078**	147.34 ± 25.04	1.545	26.04 ± 3.43	1.258	35.26 ± 3.59	.107	12.17 ± 1.89	−.778	30.60 ± 4.17	−.902	104.08 ± 9.30	−.034
	No	**9**	41.88 ± 16.01	(NS)	**79.88 ± 31.97**	**(.046)**	121.77 ± 47.12	(NS)	24.11 ± 4.98	(NS)	35.11 ± 3.40	(NS)	12.77 ± 2.16	(NS)	32.22 ± 5.44	(NS)	104.22 ± 11.98	(NS)
Perceived severity	≥Moderate	24	44.83 ± 13.61	−.718	88.62 ± 26.59	−1.065	133.45 ± 39.69	−.981	24.95 ± 4.66	−1.168	35.45 ± 3.71	−.057	12.45 ± 1.97	−.035	33.20 ± 4.69	1.554	106.08 ± 11.32	.153
	<Moderate	23	47.47 ± 11.50	(NS)	96.34 ± 22.85	(NS)	143.82 ± 32.19	(NS)	26.43 ± 3.95	(NS)	35.52 ± 3.87	(NS)	12.47 ± 1.97	(NS)	31.17 ± 4.24	(NS)	105.60 ± 9.79	(NS)

NS = not significant.
[a] DTKE = disease and treatment knowledge and expectations.
[b] AMCA = adherence to medications & clinical appointments.
[c] BME = beliefs about medication efficacy.
[d] BT = barriers to treatment.
[e] AED = antiepileptic drug.

Table 4
Correlations for the quality of discharge education and medication self-management (N = 47).

Variables	QDT[a] content	QDT[a] delivery	Total QDT[a]	DTKE[b]	AMCA[c]	BME[d]	BT[e]	Total for medication adherence
QDT[a] content	1							
QDT[a] delivery	.856***	1						
Total QDT[a]	.935***	.984***	1					
DTKE[b]	.401**	.587***	.542***	1				
AMCA[c]	.039	.143	.112	.365*	1			
BME[d]	−.084	.043	.000	.343*	.543***	1		
BT[e]	.063	.102	.092	.207	.369*	.335*	1	
Total for medication adherence	.192	.347*	.305*	.699***	.771***	.668***	.714***	1

* p < .05.
** p < .01.
*** p < .001.
[a] QDT = the quality of discharge teaching.
[b] DTKE = disease and treatment knowledge and expectations.
[c] AMCA = adherence to medications & clinical appointments.
[d] BME = beliefs about medication efficacy.
[e] BT = barriers to treatment.

management among parents of children with epilepsy. Although medication self-management is critical in children with epilepsy, very few interventional studies have focused on improving self-management in this patient population [34]. To ensure the efficacy of such interventions, it is important to identify modifiable factors that strongly influence medication self-management. Our findings indicate that discharge education for parents is significantly associated with medication self-management in children with epilepsy.

Medication adherence is a major component of medication self-management. In the present study, 93.7% of children with epilepsy maintained perfect adherence to medications, which is much higher than that reported in previous studies that measured adherence as the % of the total doses prescribed to each child (72.4% in Iran [2], 68% in Germany [4], and 79.4% in the United States [6]). Indeed, previous Korean studies involving children with epilepsy have reported medication adherence rates ranging from 63 to 80.8% [35–38]. Several studies have demonstrated that parental socioeconomic status and national insurance coverage significantly influence medication self-management and adherence in children [7,37,39,40]. Over the past 40 years, national health insurance has been introduced in Korea, covering almost the entire population [41]. Therefore, children with epilepsy and their parents have greater access to medical services, resulting in greater medication adherence. In addition, 67.6% of people who graduated from high school in Korea go to college [42]. Thus, the high rate of medication adherence in the present study may be due to the relatively high socioeconomic status of the included parents. These findings highlight the need to investigate cultural factors affecting medication self-management and adherence in children with epilepsy. Another reason underlying the higher rates of adherence in our study compared with that shown in previous work is that the other studies measured adherence over a longer period of time. Adherence has been known to remain high initially, only to start dropping after some period of time.

Parents rated the overall quality of discharge education as 7.7 out of 10 (content: 7.7; delivery: 7.7). A previous study regarding the quality of discharge education among parents of children with respiratory and neurological diseases in the United States reported content scores that were lower than the delivery scores (6.1 vs. 9.1) [43]. Our results suggest that there is a need for supplementary education in both areas despite discharge education in both areas being usually more thorough than the norm. Although the level of content was superior to that suggested in previous studies, our findings suggest that a greater emphasis should be placed on the method of content delivery, as family-centered care is still developing in Korea. Family-centered care is an important approach for promoting communication among healthcare professionals, children, and families that is known to increase the satisfaction with health services and promote efficient use of health resources [44,45]. Family-centered care consists of sharing information and

cooperation [46], requiring other family members to participate in discharge education so that they can understand how to care for the child at home. However, the application of this remains insufficient in Korea [46,47]. In addition, the current study found that parents of children with fewer AEDs had lower content scores and those without adverse effects had lower content delivery scores. The higher the number of AEDs prescribed, the more adverse effects the children experienced, and nurses in this situation tended to provide a more thorough education at discharge. Furthermore, the greater the number of AEDs, the more seriously the parent perceived their child's disease. As a result, the parents' interest in discharge education increased. Thus, during discharge education, healthcare providers must not overlook the parents of children with fewer AEDs or those without adverse effects in order to ensure effective prophylaxis.

Significant differences in medication self-management were observed based on the number of AEDs taken by the children with epilepsy. Medication self-management tended to deteriorate as the number of AEDs increased. In addition, parents of children taking a relatively greater number of AEDs had significantly lower beliefs in the efficacy of AEDs. Refractory epilepsy is diagnosed when seizure control cannot be achieved using two or more AEDs [48]. In such cases, administering even more AEDs can result in reduced seizure control. Our findings are in accordance with those of previous studies, which have reported that medication adherence is lower in children whose seizures are poorly controlled using AEDs [49]. Thus, clinicians should focus on improving self-management in children taking greater numbers of AEDs.

In addition, we observed a strong correlation between the delivery of discharge education and medication self-management. This finding is consistent with those of previous studies regarding the quality of discharge education, which reported significant associations between the delivery of discharge education and discharge outcomes [30,43]. Thus, our finding suggests that promoting the delivery of discharge education can improve medication self-management. To promote delivery, it is important to establish a standard, improved discharge protocol and facilitate communication skills training. The teach-back method can strengthen the delivery of discharge education. The goals of this method are to increase the understanding of the patient's condition, confirming knowledge acquisition, and enabling better health outcomes [50]. Parental education based on teach-back can improve the hospital-to-home transition [51].

Our findings should be interpreted within the context of several limitations. First, since this study selected participants via convenience sampling from a single institution—one of the largest hospitals in Korea—this population may not be representative of all parents of children with epilepsy. Second, we cannot exclude the possibility of bias when surveys were conducted at the unit because of the direct relationship between the parents and the nurse. Third, we utilized a

self-reported medication self-management questionnaire, which may limit the reliability of our results. Furthermore, as we did not focus on children of a specific age group during participant selection, we were unable to account for the influence of different developmental stages.

5. Conclusion

To the best of our knowledge, the present study is the first to investigate the correlation between discharge education and medication self-management among parents of children with epilepsy. Our findings indicated that medication self-management was relatively worse among children taking greater numbers of AEDs, highlighting the need for clinicians to focus on providing adequate education to parents of children taking more than three AEDs.

Conflicts of interest

None of the authors has any conflicts of interest to disclose.

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