Original Article

Psychometric Validation of the Korean Version of the Cancer Survivors' Unmet Needs (CaSUN) Scale among Korean Non–Small Cell Lung Cancer Survivors

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Purpose The purpose of the study was to validate the Korean version of Cancer Survivors' Unmet Needs (CaSUN) scale among non–small cell lung cancer survivors.

Materials and Methods Participants were recruited from outpatient clinics at the Samsung Medical Center in Seoul, South Korea, from January to October 2020. Participants completed a survey questionnaire that included the CaSUN. Exploratory and confirmatory factor analysis and Pearson's correlations were used to evaluate the reliability and validity of the Korean version of the CaSUN (CaSUN-K). We also tested known-group validity using an independent t test or ANOVA.

Results In total, 949 provided informed consent and all of which completed the questionnaire. Among the 949 patients, 529 (55.7%) were male; the mean age and median time since the end of active treatment (standard deviation) was 63.4±8.8 years and the median was 18 months. Although the factor loadings were different from those for the original scale, the Cronbach's alpha coefficients of the six domains in the CaSUN-K ranged from 0.68 to 0.95, indicating satisfactory internal consistency. In the CFA, the goodness-of-fit indices for the CaSUN-K were high. Moderate correlations demonstrated the convergent validity of CaSUN-K with the relevant questionnaire. More than 60% of the participants reported information-related unmet needs, and the CaSUN-K discriminated between the needs reported by the different subgroups that we analyzed.

Conclusion The CaSUN-K is a reliable and valid measure for assessing the unmet needs in a cancer population, thus this tool help population to receive timely, targeted, and relevant care.

Key words Unmet needs, Neoplasms, Validation, CaSUN

Introduction

To this day, non–small cell lung cancer (NSCLC) remains a major cause of cancer deaths, but improvements in curative therapies and the implementation of screening guidelines continue to increase survival rates [1]. Specifically, the five-year survival rates have improved, nearing 63% among patients with localized-stage NSCLC [1]. Owing to these improvements, the length of time that patients live with lung cancer has also increased, requiring health care providers to promote and deliver supportive care for this population.

Despite these advances, according to a systematic review [2], 5-year survivors of lung cancer still report experiencing heavy symptom burden, including dyspnea, coughing, pain, insomnia, and fatigue. Additionally, lung cancer survivors

have reported having psychosocial, practical, and spiritual unmet needs, such as those related to financial support, counseling, complementary alternative medicine, diet, and exercise [3]. Further complicating the matter, the growing number of lung cancer survivors has led to a huge demand for survivorship care [4].

Research shows that data on the unmet needs of survivors at the patient level are key for stakeholders to develop effective patient-centered supportive services [5]. Despite the importance of understanding these data, most prior studies have been conducted only among patients with advanced lung cancer [6] or had a small sample size [7]. Moreover, despite research having shown that cancer patients' unmet needs may differ by survival time [8], the reality remains that the existing comprehensive survivorship research provides

little data on the unmet needs of long-term NSCLC survivors who have completed active treatment [9]. Adding to these research gaps, most research that explored the unmet needs of lung cancer patients have used a qualitative design, and various of the few quantitative studies on the topic have not used validated instruments for assessing patients' unmet needs [10].

On this topic, the self-reported Cancer Survivors' Unmet Needs (CaSUN) scale [11] is known for enabling researchers to assess the extent to which patients have unmet supportive care needs [12], and it is also one of the major measurement tools for this construct. In fact, studies depict how this tool is better at collecting data on the unmet needs of cancer survivors than most other tools for cancer-related needs, an advantage that is believed to owe to most other tools being more relevant for patients still undergoing treatment, not for survivors [12]. Further adding to the relevance of this tool, studies demonstrate how the CaSUN has been widely used for various cancer types (e.g., breast, colon, prostate) and in various countries [12].

However, to date, the CaSUN has not been validated in lung cancer survivors, and the few studies that have applied this tool in lung cancer patients actually aimed at examining multiple cancers, thus having only a small sample for lung cancer (i.e., from 4.8%-8% of the study population) [4,5]. Moreover, the CaSUN yet to be validated in a Korean sample. Accordingly, this study aimed to validate the Korean version of the CaSUN (CaSUN-K) in Korean NSCLC survivors and quantify their unmet needs.

Materials and Methods

1. Study participants

In this cross-sectional study, study participants were recruited from the outpatient clinics of the Comprehensive Cancer Center at the Samsung Medical Center in Seoul, South Korea, from January to October 2020. The inclusion criteria were: being aged 18 years or older, diagnosed with NSCLC, receiving curative pulmonary resection with or without perioperative chemoradiotherapy, having completed cancer treatment one or more months prior to the study, and being able to speak and read Korean. The exclusion criteria were: having experienced cancer recurrence or second cancer, as these could tamper with data analysis. To provide results with valid and reliable answers to the research question, we considered adequate response rate as at least 60% based on previous studies [13].

Trained researchers explained study aims and procedures for potential participants, and after participants provided informed consent, they were asked by the researchers to complete the paper-based questionnaire.

2. Materials

The original CaSUN is a 35-item that is used to assess the needs of cancer survivors for at least 1 year following diagnosis [11]. For each item, participants answer whether the needs described were either not applicable, met, or unmet. Upon the report of an unmet need, the participant then rates the intensity of the need, from 1-3 (1, weak; 2, moderate; and 3, strong). The need items are grouped into five dimensions: existential survivorship (14 items), comprehensive cancer care (6 items), information (3 items), quality of life (QoL, 2 items), and relationship (3 items). Further, based on the suggestions of the original author of the CaSUN, seven items were retained in the tool, which are not grouped into any of these five dimensions and that are used to measure useful clinical information. The scores for the items under each domain are added to reach the score for that dimension, and total scores are the sum of the scores for all items, ranging from 0-35; higher scores represent a higher level of unmet needs.

To develop the Korean version of the instrument, we obtained permission from the original developer of the CaSUN [11]. Then, two bilingual experts translated the CaSUN into Korean, after which it was back-translated into English by two independent bilingual experts. Afterwards, a group of experts (i.e., oncologists, oncology nurses, behavioral scientists, and psychiatrists) reviewed and confirmed the contents of the instrument. In addition, we conducted a cognitive interview with 10 survivors to assess the content validity of the scale.

To examine convergent and discriminant validity, we used the Korean version of European Organisation for Research and Treatment of Cancer Quality of Life Core Questionnaire (EORTC QLQ-C30) [14] and the Korean version of the Fear of Cancer Recurrence Inventory-Short Form (K-FCRI-SF) [15]. The 30-item EORTC QLQ-C30 is a cancer-specific questionnaire, includes five dimensions—physical (five items), role (two items), cognitive (two items), emotional (four items), and social (two items); one global health status scale (two items); three symptom scales—fatigue (three items), pain (two items), and nausea and vomiting (two items); and six single items—dyspnea, appetite loss, sleep disturbance, constipation, diarrhea, and financial difficulty that assess symptoms commonly reported by patients with cancer [14]. The items request participants to report on whether they experienced a symptom during the past week, except for the physical function dimension; in the latter, items do not include information on a specific period. This scale is rated on a four-point Likert scale, ranging from 1-4 (not at all–very much), except for the global health status item, which is rated from

1-7 (very poor–excellent) [14]. We scored the EORTC QLQ-C30 items using the scoring procedures outlined in the manual, after which we linearly transformed the data to yield total scores that range from 0-100; a higher score represents a better level of functioning. The EORTC QLQ-C30 has been translated to Korean, validated [14], and has been widely used to measure the QoL of cancer survivors in Korea.

We also used the 9-item K-FCRI-SF, which assesses the severity of fear of cancer recurrence (FCR), where each item is rated on five-point Likert scale, ranging from 0-4 (not at all–very much) [15]. Total scores range from 0-36, and the higher the score, the higher the FCR [15].

We also included sociodemographic characteristic items in the questionnaire, including age, sex, marital status, education level, monthly family income, and work status. Further, we obtained clinical characteristics, including data on neoadjuvant treatment, pathologic staging, adjuvant treatment, and date of end of active treatment, by accessing patients' electronic medical records.

3. Statistical analysis

Previous tools used to measure unmet needs in oncology have typically been scored based on the strength of the unmet needs; however, such scoring resulted in multiple violations of assumptions of multivariate normality. Thus, we scored responses based on no need (=0), met need (=1), and unmet need (=2), which is a scoring consistent with the need measures in the psychiatric literature [11]. We included all 35 items in the calculation of the sum of total met, total unmet, and total needs.

We used the following steps for data analysis. First, Kaiser-Meyer-Olkin Measure of Sampling Adequacy and Bartlett's Test of Sphericity were used to assess the suitability of the data for factor analysis. We performed exploratory factor analysis (EFA) using principal-factor method which analyze the correlation matrix to explore the structure of CaSUN-K among these items. A principle axis factor procedure with a promax rotation was selected to extract latent constructs since it can be used when the assumption of normality has been violated. Items that were not grouped were classified as dimensions based on EFA. Then, we evaluated the internal consistency of the scale using Cronbach's α; we considered an α of 0.6-0.7 as acceptable, and an α of 0.8 or greater as reliable.

Second, for construct validity, we tested models through confirmatory factor analysis (CFA), and using the maximum likelihood to test whether our factor structure provided a good fit to the data. We used several goodness-of-fit indices to evaluate model fit, including the comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean squared residual (SRMR). In

Table 1. Participants' characteristics

	No. (n=949)
Age (yr)	63.4±8.8
Male sex	529 (55.7)
Marital status, yes	820 (86.5)
Education	
< High school	267 (28.1)
High school	328 (34.6)
≥ University	353 (37.2)
Currently working	398 (41.9)
Family monthly income ($1,000)	300 (150-550)
Comorbidity	710 (74.8)
Neoadjuvant treatment, yes	68 (7.2)
Pathologic staging	
0	12 (1.3)
I	697 (73.4)
II	140 (14.8)
III	100 (10.5)
Adjuvant treatment, yes	240 (25.3)
Time since the end of active treatment (mo)	18.4 (6.8-40.4)
≥ 18 mo	488 (51.4)

IQR, interquartile range; SD, standard deviation.

this study, we deemed a CFI > 0.9, and an RMSEA and a SRMR < 0.08 as being demonstrative of a good fit to the data.

Third, after confirming that the total unmet needs scores were normally distributed, we used participants' scores for the EORTC QLQ-C30 and K-FCRI-SF as criteria to examine the convergent and discriminant validity of our Korean scale by conducting Pearson correlation analysis. We hypothesized that a higher score for unmet needs would be negatively correlated with functioning scores, but positively correlated with symptoms and FCR scores. Because the CaSUN-K, the EORTC QLQ-C30, and the K-FCRI-SF measure different concepts, we hypothesized weak to moderate correlations (r=0.20-0.59) in the criterion validity.

Fourth, to examine the unmet need scores between patients with and without factors associated with unmet needs, we tested known-group validity using an independent t test or ANOVA. Recently, health professionals have started to focus more on cancer survivors' QoL during the re-entry period, namely, the transition period from the conclusion of medical treatment to survivorship (12-18 months later) [16]. During this period, survivors are commonly distressed about the alteration of their social roles, the decline in interpersonal support, and the lingering physical and psychological effects of the diagnosis and treatment of cancer [16]. Thus, we hypothesized that survivors who ended the active treatment less than 18 months ago would report more unmet needs than survivors who had ended their active treatment
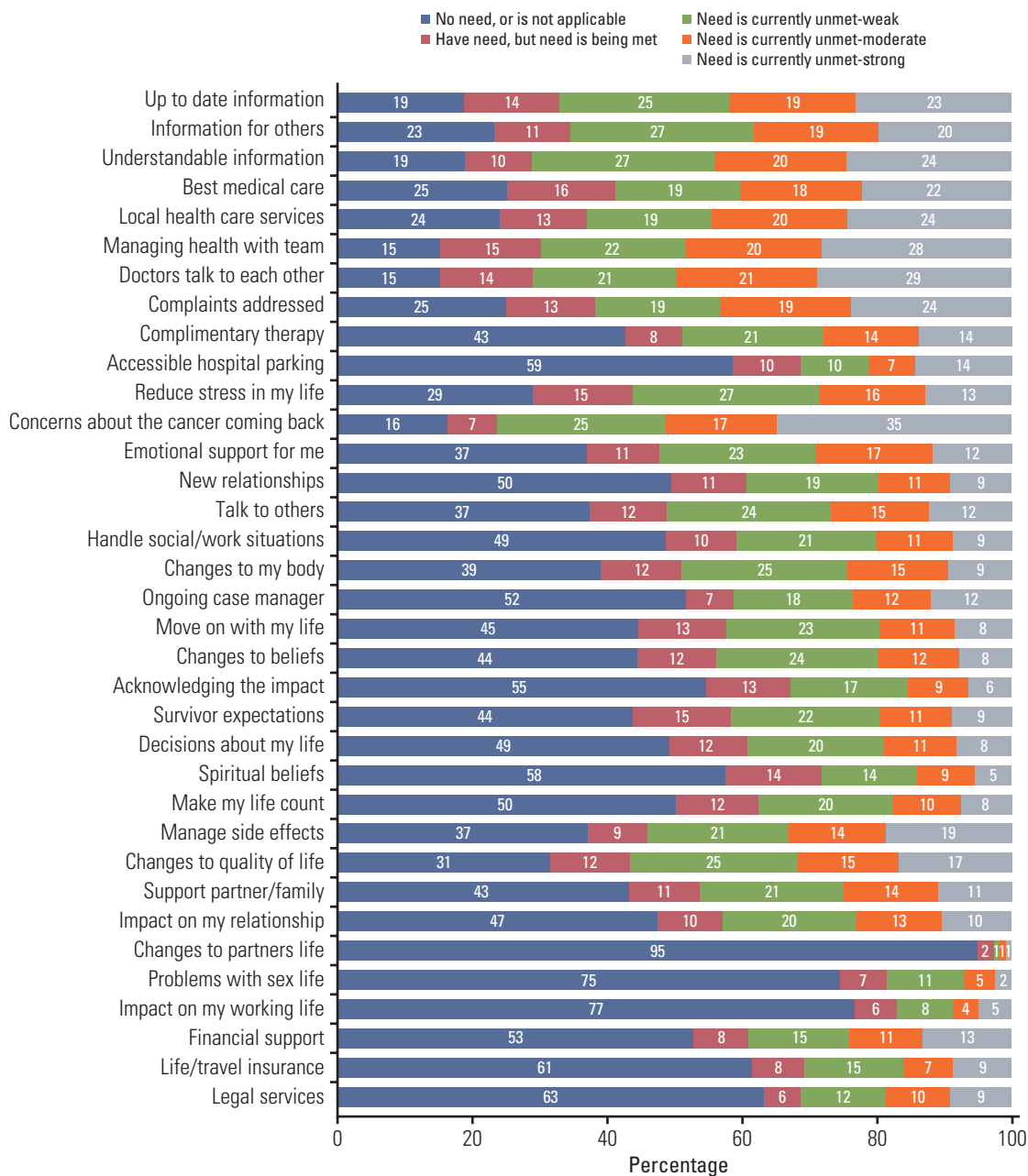
Fig. 1. Distributions of patient unmet needs.

over 18 months ago. In addition, based on previous literature [17], we compared the unmet needs scores of patients from the younger age group (< 65) with those of patients from the older age group, from the female and male sexes, and with and without lower education, lower income, and comorbidity. We calculated the ceiling and flooring effects by the percentage of the lowest or highest score achieved by the respondents. We considered a ceiling and flooring effect of more than 15% as significant.

Results

1. Participants' characteristics

In total, 1,220 patients were invited to participate in this research, 1,014 (83%) agreed to participated in the study providing informed consent. Then we excluded 65 patients having experienced cancer recurrence or second cancer who were not eligible for this study resulting in 949 patients in the final analysis. Among the 949 patients, 529 (55.7%) were

Table 2. Factor loadings from the exploratory factor analysis and reliability of the CaSUN-K's dimensions

Original dimension and item	Factor loading			Reliability of the dimension
	F1	F2	F3	
Information				0.89
Up-to-date information	−0.0217	0.8203[a]	−0.0859	
Information for others	0.0182	0.7763[a]	−0.0255	
Understandable information	−0.0307	0.8548[a]	−0.053	
Comprehensive cancer care				0.87
Best medical care	0.0115	0.729[a]	0.0881	
Local health care services	−0.0147	0.7051[a]	0.0578	
Managing health with a team	−0.0847	0.8391[a]	0.0012	
Doctors talk to each other	−0.0315	0.7884[a]	0.0138	
Complaints are addressed	0.0137	0.6911[a]	0.0484	
Complimentary therapy[b]	0.0115	0.729[a]	0.0881	
Accessible hospital parking	0.0874	0.0572	0.5421[a]	
Existential survivorship				0.95
Reduce stress in my life	0.3074	0.428[a]	0.0932	
Concerns about the cancer coming back	0.3174	0.5086[a]	−0.1399	
Emotional support for me	0.6598[a]	0.1981	−0.0168	
New relationships	0.7705[a]	−0.0034	0.0742	
Talk to others	0.6557[a]	0.1548	−0.0212	
Handle social/Work situations	0.6714[a]	0.0198	0.0969	
Changes to my body	0.6846[a]	0.1512	−0.0052	
Ongoing case manager[b]	0.4[a]	0.1105	0.2596	
Move on with my life	0.7322[a]	0.008	0.0902	
Changes to beliefs	0.8443[a]	0.0019	−0.0555	
Acknowledging the impact	0.8386[a]	−0.0779	0.0292	
Survivor expectations	0.8563[a]	0.0547	−0.1074	
Decisions about my life	0.9242[a]	−0.053	−0.0773	
Spiritual beliefs	0.8167[a]	−0.1323	0.0369	
Make my life count	0.8835[a]	−0.0833	0.0193	
Quality of life				0.81
Manage side effects	0.2481	0.4142[a]	0.1344	
Changes to quality of life	0.4183[a]	0.4124[a]	0.0468	
Relationships				0.68
Support partner/Family	0.5917[a]	0.1198	0.1378	
Impact on my relationship	0.6401[a]	0.0724	0.1007	
Changes to partners life[b]	−0.1312	−0.0652	0.4262[a]	
Problems with sex life	0.3181[a]	−0.0288	0.2455	
Financial (new dimension)				0.77
Impact on my working life[b]	0.015	−0.0658	0.5885[a]	
Financial support[b]	0.0993	0.0534	0.5716[a]	
Life/Travel insurance[b]	0.0751	−0.0338	0.6517[a]	
Legal services[b]	0.0924	0.0459	0.6259[a]	

CaSUN-K, Korean version of the Cancer Survivors' Unmet Needs. [a]The strongest factor loading, [b]Based on the suggestion of the original author, seven items, originally not grouped into any dimension, were retained to measure clinically useful information.

male; the mean age (standard deviation) was 63.4±8.8 years; 28.1% had less than high school education; and the median time since the end of active treatment was 18 months (Table 1). Most participants reported concerns about the can-

cer coming back (77%), and more than half had unmet needs regarding up-to-date information (67%), information for others (66%), understandable information (71%), local health care services (63%), managing health with team (70%), doc-
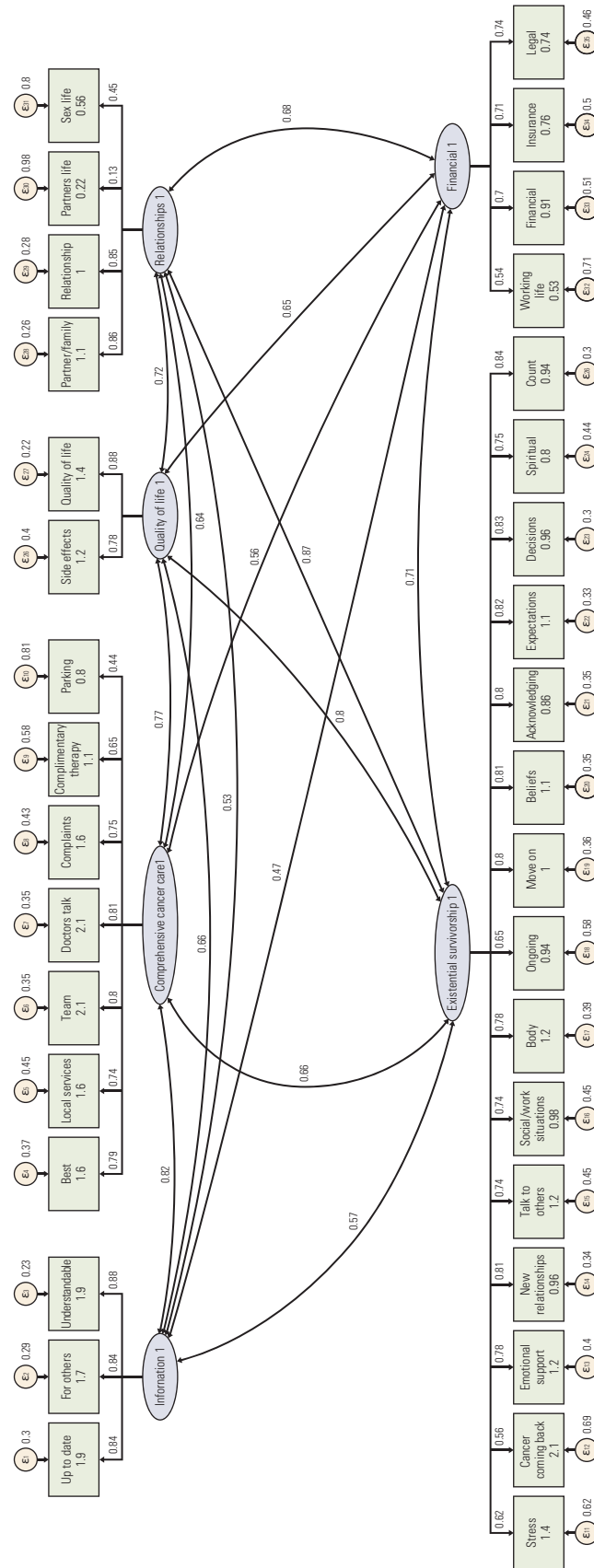
Fig. 2. Confirmatory factor analysis of the Korean version of Cancer Survivors' Unmet Needs.

Table 3. Pearson's correlation coefficients for the CaSUN-K, EORTC QLQ-C30, and K-FCRI-SF

	CaSUN-K						
	Information	Comprehensive cancer care	Existential survivorship	Quality of life	Relationships	Financial issues	Total
Overall QoL/Health status	−0.21	−0.23	−0.27	−0.28	−0.16	−0.17	−0.27
Function							
Physical	−0.17	−0.23	−0.25	−0.27	−0.17	−0.23	−0.27
Role	−0.19	−0.24	−0.30	−0.30	−0.19	−0.21	−0.30
Emotional	−0.30	−0.33	−0.41	−0.35	−0.23	−0.22	−0.40
Cognitive	−0.17	−0.19	−0.25	−0.21	−0.17	−0.14	−0.25
Social	−0.25	−0.27	−0.39	−0.32	−0.28	−0.30	−0.39
Symptoms							
Fatigue	0.26	0.28	0.32	0.33	0.20	0.23	0.33
Nausea/Vomiting	0.14	0.17	0.16	0.18	0.10	0.18	0.19
Pain	0.23	0.22	0.24	0.27	0.13	0.20	0.26
Dyspnea	0.16	0.17	0.21	0.24	0.15	0.17	0.23
Insomnia	0.16	0.18	0.22	0.21	0.14	0.13	0.22
Appetite loss	0.17	0.18	0.23	0.21	0.13	0.15	0.23
Constipation	0.13	0.14	0.14	0.14	0.11	0.13	0.16
Diarrhea	0.10	0.11	0.13	0.10	0.11	0.13	0.14
Financial	0.19	0.20	0.32	0.27	0.25	0.37	0.33
Fear of cancer recurrence	0.37	0.39	0.52	0.46	0.34	0.29	0.51

All numbers in this table were obtained via Pearson's correlation analysis, p < 0.05. CaSUN-K, the Korean version of the Cancer Survivors' Unmet Needs; EORTC QLQ-C30, European Organisation for Research and Treatment of Cancer Quality of Life Core Questionnaire; K-FCRI-SF, Korean version of the Fear of Cancer Recurrence Inventory-Short Form; QoL, quality of life.

tors talking to each other (71%), and complaints addressed (62%) (Fig. 1).

In total, 1.7% and 3.3% of the respondents obtained the highest or lowest scores for unmet needs, respectively. Specifically, the proportion of participants who had the ceiling effects for the information, comprehensive cancer care, existential survivorship, QoL, relationship, and financial issues dimensions were 71.2%, 28.8%, 21.8%, 47.6%, 3.4%, and 13.8%, respectively. Moreover, the proportion of participants who showed the floor effect for the dimensions were 12.9%, 7.8%, 8.4%, 26.0%, 35.2%, and 37.8%, respectively (Fig. 1).

2. Exploratory factor analysis

The EFA extracted three factors that had an eigenvalue > 1 and that explained 94.7% of the variance. Among the seven items that were not grouped into any dimension, four items were classified as a factor. After reviewing the items, we labelled this factor as financial issues (Table 2).

We also observed that the other factor loadings were somewhat different from those in the original scale (Table 2). In this study, the item "Accessible hospital parking" was included in the financial issues dimension, not in the comprehensive cancer care dimension (i.e., in the original). Moreover, the

items "Reduce stress in my life" and "Concerns about the cancer coming back" were grouped under the information dimension. Meanwhile, "Support partner/family" and "Impact on my relationship" were grouped under the existential survivorship dimension.

3. Internal consistency

Overall, the CaSUN-K demonstrated good internal consistency and reliability, with a Cronbach's α of 0.96. Moreover, the Cronbach's α for the scale's dimensions were 0.89, 0.87, 0.95, 0.81, 0.68, and 0.77 for the information, comprehensive cancer care, existential survivorship, QoL, relationship, and financial issues dimensions, respectively (Table 2).

4. CFA and construct validity

As suggested by the results of EFA, we conducted a CFA using a six-factor model and 35 items. After adding relationships between some residuals of items regarding the modification index, this model showed a good fit to the data: CFI=0.90, RMSEA=0.07, SRMR=0.06 (Fig. 2).

5. Convergent validity

Regarding the total unmet needs for the CaSUN-K, it was significantly correlated with (Pearson correlation coeffici-

Table 4. Known-group validity of the Korean version of the Cancer Survivors' Unmet Needs

	Information	Comprehensive cancer care	Existential survivorship	Quality of life	Relationships	Financial issues	Total
Age (yr)							
< 65 (n=510)	2.46±1.03	5.00±2.13	8.62±5.48	2.52±1.67	1.44±1.23	1.57±1.48	20.45±10.30
≥ 65 (n=439)	2.31±1.10	4.87±2.21	8.30±5.56	2.31±1.72	1.36±1.22	1.32±1.40	19.43±10.54
p-value	0.03	0.37	0.38	0.05	0.29	< 0.01	0.13
Sex							
Male (n=529)	2.37±1.10	4.91±2.26	8.38±5.63	2.38±1.71	1.57±1.30	1.53±1.50	20.07±10.84
Female (n=420)	2.42±1.01	4.98±2.05	8.59±5.38	2.47±1.67	1.18±1.09	1.35±1.37	19.85±9.87
p-value	0.48	0.64	0.56	0.39	< 0.01	0.06	0.74
Marital status							
Non-married (n=128)	2.46±1.03	4.97±2.12	8.85±5.28	2.54±1.72	1.07±1.12	1.70±1.42	20.39±9.98
Married (n=820)	2.38±1.07	4.94±2.18	8.40±5.55	2.40±1.69	1.45±1.24	1.42±1.45	19.90±10.49
p-value	0.44	0.88	0.39	0.40	< 0.01	0.04	0.62
Education							
< High school (n=267)	2.32±1.10	4.81±2.19	8.48±5.18	2.48±1.68	1.35±1.16	1.52±1.39	19.82±9.98
High school (n=328)	2.39±1.06	4.99±2.19	8.49±5.64	2.45±1.69	1.36±1.25	1.52±1.49	20.07±10.64
≥ University (n=353)	2.45±1.04	5.00±2.13	8.43±5.67	2.35±1.70	1.47±1.25	1.35±1.46	19.99±10.57
p-value	0.31	0.48	0.99	0.57	0.38	0.24	0.96
Work status							
No (n=398)	2.41±1.05	4.98±2.17	7.94±5.57	2.29±1.72	1.46±1.27	1.51±1.50	19.54±10.58
Yes (n=551)	2.38±1.07	4.91±2.16	8.85±5.45	2.52±1.67	1.36±1.20	1.42±1.41	20.29±10.30
p-value	0.75	0.65	0.01	0.04	0.21	0.34	0.27
Family monthly income							
< $3,000 (n=335)	2.35±1.09	4.90±2.20	9.14±5.25	2.49±1.70	1.44±1.19	1.69±1.42	20.84±10.17
≥ $3,000 (n=536)	2.39±1.08	4.93±2.20	8.01±5.68	2.38±1.70	1.37±1.24	1.29±1.46	19.30±10.66
p-value	0.56	0.85	< 0.01	0.36	0.40	< 0.01	0.03
Comorbidity							
No (n=239)	2.40±1.07	4.78±2.18	8.40±5.54	2.32±1.68	1.43±1.26	1.58±1.54	19.85±10.58
Yes (n=710)	2.39±1.06	5.00±2.16	8.49±5.51	2.45±1.70	1.39±1.22	1.41±1.42	20.02±10.37
p-value	0.90	0.19	0.81	0.30	0.70	0.12	0.83
Time since the end of active treatment							
< 18 mo (n=461)	2.58±0.91	5.25±1.97	9.44±5.35	2.77±1.60	1.51±1.22	1.62±1.45	21.87±9.81
≥ 18 mo (n=488)	2.22±1.17	4.65±2.30	7.56±5.52	2.09±1.72	1.30±1.23	1.30±1.43	18.19±10.67
p-value	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

ents) the scores of the EORTC QLQ-C30 (r=–0.27 to 0.40) and the K-FCRI-SF (r=0.51). In particular, the financial issues dimension in the CaSUN-K and the financial difficulties dimension in the EORTC QLQ-C30, as well as the existential survivorship (r=0.52) and QoL (r=0.46) dimensions in the CaSUN-K and the K-FCRI-SF were relatively more correlated than others (Table 3).

6. Known–group validity

The CaSUN-K discriminated between the needs reported by different subgroups in our sample. Specifically, those in the younger age group were more likely to report information (2.46 vs. 2.31, p=0.03) and financial unmet needs (1.57 vs. 1.32, p < 0.01) than those in the older age group. Male survivors were more likely to report relationship unmet needs (1.57 vs. 1.18, p < 0.01) than female survivors. Married survivors were more likely to report relationship unmet needs (1.45 vs. 1.07, p < 0.01) and less likely to report financial unmet needs (1.42 vs. 1.70, p=0.04) than non-married survivors. The survivors who had under $3,000 of family income were more likely to report total (20.84 vs. 19.30, p=0.03), existential survivorship (9.14 vs. 8.01%, p < 0.01), and financial unmet needs (1.69 vs. 1.29, p < 0.01) than survivors who had more than $3,000 of family income (Table 4).

In addition, compared to the survivors who ended the active treatment less than 18 months ago, those who had ended their active treatment over 18 months ago were more likely to report total unmet needs (21.87 vs. 18.19, p < 0.01), information (2.58 vs. 2.22, p < 0.01), comprehensive cancer care (5.25 vs. 4.65, p < 0.01), QoL (2.77 vs. 2.09, p < 0.01), relationship (1.51 vs. 1.30, p < 0.01), and financial unmet needs (1.62 vs. 1.30, p < 0.01) (Table 4).

Discussion

In this study, we found the CaSUN-K to be a reliable and valid measure of unmet needs among Korean NSCLC survivors, and although the goodness-of-fit indices of the CaSUN-K were also high, the factor loadings were different from those for the original scale. Further, we included a novel factor in the scale (i.e., the financial issues dimension), and moderate to high correlations demonstrated the convergent validity of CaSUN-K with the relevant EORTC QLQ-C30 and K-FCRI-SF scales. The most frequently reported item regarding unmet needs was "Concern about cancer coming back." Additionally, more than 60% of the participants reported information-related unmet needs, and the CaSUN-K discriminated between the needs reported by the different subgroups that we analyzed.

The results indicated that the internal consistency and reli-

ability of the Korean revised measure were high. In addition, all dimensions showed acceptable Cronbach's α levels, hence demonstrating acceptable internal consistency. However, the structure of the CaSUN-K for Korean NSCLC survivors was different from that of the original for an Australian sample, which had a five-factor model. The original five factors, including existential survivorship, comprehensive care, information, QoL, and relationship, comprised 28 items of the 35 in the scale 35 [11]. In the original study, items were excluded if they were endorsed by less than 10% of the participants (e.g., working and fertility) or if the items did not load with a value ≥ 0.3 on the factor solution (e.g., complementary and/or alternative therapy, financial support, travel/life insurance, legal services, and ongoing case manager). Although we found that less than 10% of participants had unmet needs in "Changes to partners life", we included all the item in the EFA and we found that the items working life, financial support, travel/life insurance, and legal services were grouped into a single factor. Thus we called the factor including these items financial issues. On the topic, research shows that cancer care costs are rising at two to three times the rate of other health care costs [18]. Thus, our scale accounts for the fact that measuring the financial unmet needs of cancer patients is of importance for this population owing to the increased health care costs that they customarily experience.

Through EFA, we also found that some of the items in our scale were loaded into dimensions that differ from those in the original scale. This difference in factor analysis between the two studies may partly owe to the cross-lingual and -cultural adaptation processes. Particularly, while the item "Accessible hospital parking" was included under the comprehensive cancer care dimension of the scale in other countries, it was included under the financial issues dimension in the CaSUN-K. Based on prior research, the correlation between parking issues and financial issues might be related to the ability to afford a car, which is a traditional indicator of poverty [19]. Moreover, included under the existential survivorship dimension in the original scale, the item "Concerns about the cancer coming back" was loaded into the information dimension in the CaSUN-K, not the original dimension. According to a previous study, insufficient and inaccurate information about cancer prognosis and recurrence risks are known predictors of fear and uncertainty among cancer survivors [20]. Thus, the item concerns about the cancer coming back might be grouped in the information dimension.

Our assessments for the criterion validity of the CaSUN-K showed that total unmet needs had weak to moderate association with the function and symptom dimensions of the EORTC QLQ-C30 (r=–0.27 to 0.40) and the scores for the K-FCRI-SF (r=0.51). Moreover, survivors who had nega-

tive functioning scores reported more unmet needs; these findings are congruent with prior research on other cancer patients [21]. In addition, cancer survivors with higher levels of FCR had more unmet needs. As in previous literature [22], FCR was triggered by various unmet needs, including information needs, social constraints, poor problem-solving skills, concerns about the financial consequences of treatment, and regret about treatment decisions. Thus, we observed a positive correlation between the number of unmet needs and the FCR.

In this study, the most frequently reported unmet need was concern about cancer recurrence. Since FCR could negative affect to emotional and social QoL [23], patients who are at greater risk of experiencing FCR must be identified and supported. Additionally, more than 60% of the participants in our study reported information-related unmet needs. On the topic of information, a qualitative study showed that patients with lung cancer seek forms of empowerment amid their health care interactions, such as forming communities for information and experience sharing [24]. According to a systematic review, patients viewed knowledge as power and longed for information accessibility, sought information online, and viewed educational programs positively [25]. Hence, in our current era of widely available information, patients wanted to be informed and to participate in shared decision-making. Accordingly, we suggest for stakeholders (e.g., health care providers and advocacy organizations) to endeavor to share medical and disease-related information in an understandable and lay-friendly way.

In our analysis for known-group validity, as expected, the younger age group was more likely to report information- and financial-related unmet needs than the older age groups. According to a qualitative study, younger cancer survivors are expected to face unique challenges; since they are in an age group that tends to be more socially active, these cancer survivors often suffer from extreme stress and lose the will to live because they cannot maintain a full-time job nor fulfill their family responsibilities [8]. In addition, research shows that younger patients were less likely to have high achievements in work, school, or a committed/marital relationship [26]. Up to 60% of respondents expressed a desire or need for age-appropriate information, including infertility information and camp or retreat programs for younger adults [26]. Thus, it is needed to prepare education or counseling program to reduce age-appropriate unmet needs.

In our sample, the unmet needs scores also differed by sex, marital status, income status, and survival time. Regarding the relationship dimension of the CaSUN-K, men reported higher unmet needs regarding "sexual life" than women. This result was similar to that of a previous cross-sectional survey, in which male cancer patients had higher demands

for sexual information and psychosocial help regarding sex-related topics than female cancer patients [27]. Regarding marital status, married survivors in our sample mentioned higher relationship-related unmet needs; we believe this may owe to the contents of the items under the relationship dimension, which include topics on partners' lives or sexual issues and may not be that applicable to non-married survivors. Despite these results and considering the limitations of CaSUN regarding the assessment of the relationship dimension, we deemed that our study participants were not highly affected in their relationships. At the same time, we acknowledge that the relationship issues faced by these survivors may not have been fully covered by the specific items in the CaSUN. Thus, we see the need for future research to develop additional items for CaSUN-K that measure the relationship between cancer survivors and other parties, including family members (e.g., daughters, sons, or caregivers), friends, and co-workers.

Regarding financial issues, as expected, the lower income group in our sample was more likely to report financial unmet needs than the higher income group (1.69 vs. 1.29, $p < 0.01$). However, the lower income group was also more likely to report existential survivorship unmet needs. According to a qualitative study, financial distress is a major reason for uncertainty in both survivors and caregivers, as it leads to a feeling of lack of control and an inability to make plans [28]. This may explain why the result in our study regarding the existential survivorship dimension for the lower income group.

Compared to the survivors who ended the active treatment less than 18 months ago, those who had ended their active treatment over 18 months ago were more likely to report unmet needs across various dimensions of the CaSUN-K. Previous studies revealed that patients with a recent diagnosis had more illness- and treatment-related unmet needs [29]. Based on these past results, we may deem that our CaSUN-K is a valid measurement tool for unmet needs in Korean NSCLC survivors. Nonetheless, those who had ended their active treatment over 18 months ago in our sample also had moderate levels of unmet needs across various dimensions; this finding was also supported by the literature [29]. These results serve to remind stakeholders (e.g., health care professionals) about the need to evaluate and intervene continuously on such patients, regardless of the time passed since diagnosis and active treatment completion.

This study had some limitations. First, we exclusively recruited individuals who visited a clinic at one institution in Korea; hence, these findings may not be generalizable to patients in other settings. However, the sociodemographic of our center were similar to those in the nationally representative sample [30]. Furthermore, we tested the valid-

ity of our scale in participants with low-literacy levels (i.e., 28.2% of our sample comprised people with low educational level). Hence, considering the characteristics of our study participants, we may imply that the CaSUN-K has acceptable psychometric properties for use in patients with diverse backgrounds including low-literacy population. Second, our research did not include an alternative questionnaire that effectively measures unmet needs to confirm the convergent validity of the CaSUN. Third, we did not perform a test-retest reliability analysis; notwithstanding, the CaSUN has already had its reliability confirmed, albeit with a moderate level of evidence, in prior research [12].

Despite these limitations, the strength of this research lies on our use of standardized translation processes and systematic validation methods, which we deemed effective for providing evidence to the usefulness of the CaSUN-K for assessing the unmet needs of Korean NSCLC survivors. Accordingly, whenever researchers or professionals see the need to assess the unmet needs of Korean NSCLC survivors in order to ensure that this population receives timely, targeted, and relevant care, the CaSUN-K may prove useful by allowing them to ground their decision-making process in appropriate data.

Author Contributions

Conceived and designed the analysis: Kang D, Lee G, Shin DW, Cho J.
Collected the data: Lee G, Kim S, Nam H, Kong S, Shin S, Lee JK, Jung W, Shin S, Kim HK, Zo JI, Shim YM, Shin DW, Cho J.
Performed the analysis: Kang D, Shin S.
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