The purpose of this study is to describe the practice of nurse anesthesia in the Republic of Korea and to identify trends, policy, and other factors that affect Certified Registered Nurse Anesthetists (CRNAs) as a profession. The authors conducted a descriptive study using a cross-sectional online survey of members of the Korean Association of Nurse Anesthetists. The data were collected between July 1 and September 15, 2015. A total of 267 surveys were analyzed. Descriptive and nonparametric analysis of data was used to determine differences in practice and job satisfaction related to level of preparation. There were statistically significant differences in work satisfaction between CRNAs and anesthesia registered nurses (ARNs) and statistically significant differences in components of practice between CRNA and ARN respondents. The practices of CRNAs and ARNs in South Korea demonstrate important differences that are likely the result of different levels of education, clinical training, and autonomy. The authors also note that the current CRNA workforce is aging, and many CRNAs plan to retire within the next 10 years. Because only one university produces 10 or fewer CRNAs annually, the profession will experience major attrition in the future.

Keywords: Anesthesia registered nurse (ARN), Certified Registered Nurse Anesthetist, CRNA, job satisfaction, nurse anesthesia practice.

In the Republic of Korea (South Korea) today, nurses may enter the practice of nurse anesthesia by either of 2 separate pathways. The first is via a degree-producing, university-based educational program. These programs are designed to train advanced practice nurses as Certified Registered Nurse Anesthetists (CRNAs). Since 2005 CRNAs have obtained graduate degrees along with a certification in nurse anesthesia practice. The second path is for registered nurses who complete a hospital-based anesthesia training program. These programs do not confer advanced anesthesia degrees and do not require national certification. Furthermore, training is provided in specific practice settings by the physicians with whom these nurses will work. As a result, content and quality of training may vary between institutions and physicians. For the purpose of this study, the authors refer to these nurses as anesthesia registered nurses (ARNs). In a review of the literature, only one article was located that studied the roles between these 2 groups of nurse anesthetists. To our knowledge, the differentiation of clinical practice between CRNAs and ARNs in South Korea has not been addressed in the literature.

The primary purpose of this project is to describe these 2 populations of nurse anesthesia providers who practice in South Korea and to identify areas in which their activities differ on the basis of education, training, and scope of practice. A secondary purpose is to discover if the difference in preparation between CRNAs and ARNs is related to differences in job satisfaction between these groups of anesthesia providers. This article reviews the history of Korean CRNAs and explores the development of the dual pathway to nurse anesthesia practice in South Korea. One aim of the study is to identify issues common to both types of anesthesia providers and locate areas where practice may overlap or where the scope of practice becomes confused. The article concludes with a report of findings and an analysis of practice differences with suggestions for future research.

Background
Nurse anesthetists have practiced in South Korea for the past 55 years. Following the Korean Conflict (1950-1953), the South Korean Ministry of Defense recognized the need to supplement anesthesia care with qualified nurse anesthesia providers. In 1961, the first 5 Korean Army nurses trained as anesthesia providers in a military medical facility. The first civilian nurse anesthetist to practice in Korea was an American missionary, Sr Margaret Kollmer. Sr Kollmer trained as a nurse before becoming a nun with the Maryknoll Sisters. Her order asked her to train as a nurse anesthetist to meet postwar needs in Asia. In
The International Federation of Nurse Anesthetists (IFNA) was founded in 1989 and currently has members in 41 countries. Its purpose is to promote quality anesthesia care worldwide. More information can be found on its website at http://ifna.site/.

In 1973, the National Assembly enacted Medical Law Article 56, which created the professional system under which CRNAs would practice. In the following years, a total of 13 hospitals offered CRNA training programs nationwide. Sr Kollmer led the effort to create the Korean Association of Nurse Anesthetists (KANA), which was chartered in 1979. She and other pioneer Korean CRNAs established the first graduate-level nurse anesthesia program in South Korea.3,4

The revised Medical Service Act of 2003 recognized CRNAs as 1 of 4 advanced practice nurses in South Korea.3,7 This recognition was quickly followed by a move toward university-based CRNA master’s programs. By 2005, the Korean Accreditation Board of Nursing began administering the National Certification Examination for CRNAs.5,8 Since 1990 KANA has continued to help set the standards for international nurse anesthesia practice as a member of the International Federation of Nurse Anesthetists.8

In 2013, there were 13 recognized advanced nursing practices in South Korea. More than 800 students study at 105 separate institutions in graduate-level programs ranging from gerontology and oncology to pediatrics and public health.8 Although most other advanced practice graduate programs increased in number, university-based training programs for CRNAs have decreased. In 2015 only one university-based advanced practice CRNA program remained in operation and graduated fewer than 10 new CRNAs each year.2,9

Much like CRNAs in the United States, South Korean nurse anesthesia providers must contend with interprofessional conflict.10,11 Anesthesiologists, seeking to preserve their authority and guard professional boundaries, create barriers to CRNA practice. According to a 2013 study, 53% of CRNAs in South Korea worked at medical facilities where anesthesiologists were employed, whereas 47% worked at facilities without anesthesiologists.7 This interprofessional conflict creates a dilemma for the South Korean healthcare industry. In South Korea, a country of 50 million people, there are only 4,824 anesthesiologists and 619 CRNAs,7 an insufficient number to provide needed access to anesthesia services. To meet the demand for anesthesia service, anesthesiologists and hospitals train registered nurses to help extend the practice of anesthesia providers.

Because there is no certifying body for ARNs and training is conducted by multiple institutions throughout the country, it is difficult to ascertain the exact number now practicing. There are no published numbers, and KANA was not able to provide a figure.

These ARNs are trained to work under direct supervision by the anesthesiologists who provide the training. The use of ARNs allows greater access to anesthesia services, but also gives the anesthesiologist greater control over anesthesia services. Using ARNs may limit opportunities for university-trained CRNAs to practice.

Most ARNs are well educated and some hold advanced degrees. However, ARNs do not necessarily receive graduate or university-based anesthesia education, are not eligible for certification, and are not licensed by the Ministry of Health and Welfare as advanced practice nurses. Anesthesia registered nurse practice is neither codified by national legislation, nor are there uniform standards for the level of training or the scope of practice. Instead, ARN training needs and scope of practice are determined by local hospitals and by the anesthesiologists with whom they train and practice. In the absence of uniform national standards, the level of training and the scope of practice vary greatly from institution to institution and between anesthesiologists.

Although CRNA practice in South Korea developed on the American model of practice, the professional model has diverged. In the United States, anesthesia services performed by an anesthesiologist are recognized as medical practice. When the service is provided by a CRNA, it is recognized as nursing practice. The status of CRNAs as advanced practice nurses is codified and protected by State Nurse Practice Acts.10

In South Korea, CRNA practice was formally recognized in 1973 when the national legislature enacted Medical Law Article 56. This law was strengthened in 2003 by the Revised Medical Service Act.1,5,7 However, although a professional nurse anesthesia system exists and the practice is recognized as an advanced anesthesia practice with certification, there is no clearly established or codified scope of practice by CRNAs.12

The impact of this ambiguity was later highlighted by a Korean Supreme Court decision. In 2004, a patient died while under the care of a CRNA practicing in a small surgical clinic under a surgeon’s supervision. The CRNA was charged with illegally practicing medicine, and the case eventually made its way to the Supreme Court. In 2010 the court found the CRNA guilty of practicing

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a The International Federation of Nurse Anesthetists (IFNA) was founded in 1989 and currently has members in 41 countries. Its purpose is to promote quality anesthesia care worldwide. More information can be found on its website at http://ifna.site/.
medicine without a medical license. This decision threw the practice of nurse anesthesia into a state of confusion, and since that time CRNAs have practiced without guaranteed legal protection.3,6,7,12

The problem of professional identity for CRNAs is further exacerbated by developments affecting membership in KANA. Originally established by Sr Kollmer to support and guide the practice of CRNAs, KANA now accepts both CRNAs and ARNs for membership. Falling under the auspices of the Korean Nurses Association, KANA is required to maintain at least 1,000 members on its rolls to keep its affiliation as a specialty practice. With only 619 CRNAs in the country and a single university program preparing nurses to practice as CRNAs, this requirement would be impossible to meet.3,13 But by expanding its membership to include ARNs, KANA is able to continue its support of nurse anesthesia practice. However, CRNAs may soon no longer be the majority of association members. As a result, KANA may no longer be in a position to adequately represent the interests and particular needs of CRNAs in South Korea.

Methods
Members of KANA were asked to complete an online survey that describes the components of their jobs, location, and satisfaction with their work. Both CRNAs and ARNs were included in the survey. In addition to quantitative information about nurse anesthesia practice in South Korea, the survey also collected qualitative information about professional practice concerns. Respondents also provided information regarding age, gender, and plans for retirement. Finally, respondents were given the opportunity to provide written comments regarding their greatest professional concerns. These responses were collected in Hangul (Korean language) and translated for later use in content analysis.

The survey was adapted from a 2014 membership profile survey developed and administered by the American Association of Nurse Anesthetists (AANA). For validation, the modified survey questions were sent to 4 professors from the University of Southern Mississippi College of Nursing, Hattiesburg, Mississippi, each with more than 10 years’ teaching experience. The validated survey was then translated into Hangul. The translation and cultural accommodations were validated by South Korean CRNAs currently practicing in the United States, as well as CRNAs and ARNs in South Korea.

After the authors obtained permission from the AANA, they adapted the survey instrument to accommodate culturally sensitive topics. Cultural considerations played an important role in adapting the survey for use with this population. For example, asking for personal information is often considered as disrespectful. Additionally, identifying geographic locations in a small country like Korea would make it easy to identify the specific individual.

Because of these considerations, geographic and practice locations through which individuals might be identified were omitted from the survey, as was salary information.

• Sample. The study population consisted of approximately 1,000 KANA members and included both CRNAs and ARNs. A power analysis indicated that a total sample size of 143 was required to obtain a probability of .05, power of .80, and a moderate effect size (.50). A total of 281 surveys were returned, of which 267 were analyzed. Fourteen surveys were omitted from the study because of incomplete data. This convenience sample introduced bias in that it represents a self-selected group of ARNs and CRNAs. However, because nurse anesthesia providers are members of KANA, self-selection into the organization itself does not compound this bias. Because membership in KANA is voluntary, practicing CRNAs and ARNs who are not KANA members were excluded from the survey.

• Data Collection. After obtaining approval from the University of Southern Mississippi institutional review board and support from KANA, the revised survey was administered using a confidential online survey (Qualtrics, Provo, Utah) between July 1 and September 15, 2015, to all KANA members. Each member of KANA received an email invitation with a link to the survey. Survey reminders were sent every 2 weeks.

The 22-question survey instrument was designed to obtain sociodemographic information from KANA members, as well as to collect details of the professional practice of nurse anesthesia in South Korea (Table 1). In addition to age, education, gender, and years of experience, respondents were asked to indicate their level of satisfaction with their practice on a 5-point Likert scale. Components of nurse anesthesia practice as well as the frequency that each component was performed were also collected.

Informed consent was implied when respondents completed and submitted the survey. Respondents submitting surveys with 50% or more of the questions unanswered were considered to have withdrawn their consent to participate, and their responses were removed from the study. Completed surveys were received from 281 KANA members, representing a 28.1% return rate. Of these, 267 surveys were included in the study. All data collected and used for the study were kept anonymous.

• Data Analysis. Data were examined for missing responses and patterns of missing responses. No patterns of missing responses were identified. The data were analyzed using nonparametric statistical analyses in SPSS to locate statistically significant differences in work satisfaction (Kruskal-Wallis) and components of practice between groups ($\chi^2$).

Results
Among the 267 respondents, 50.2% (n = 141) identified
themselves as ARNs, and 44.8% (n = 126) identified as CRNAs. Of the ARNs who identified their gender, 6.4% were male (n = 9) and 92.9% (n = 131) were female. The CRNA respondents comprised 22.2% men (n = 28) and 77.8% women (n = 98; Figure 1; data given in number of respondents for all figures).

Two trends were identified from demographic data regarding the respondents’ age and plans for retirement. Of the CRNAs, 45.2% were aged 50 to 59 years and 7.9% were over 60 years age. This means 53.1% of CRNAs were

Table 1. Sample of Korean Nurse Anesthetist Survey (July 2015)

<table>
<thead>
<tr>
<th>Question</th>
<th>Options</th>
</tr>
</thead>
</table>
| 1. Please indicate whether you are an anesthesia registered nurse or a Certified Registered Nurse Anesthetist: | a. Anesthesia Registered Nurse  
b. Certified Registered Nurse Anesthetist |
over age 50. Within the next 10 years, 68.3% of the CRNAs say they plan to retire. Of these, 29.4% plan to retire by the end of 2020. As the CRNA workforce ages, many plan to retire. The age and retirement data are different for ARNs. Of the respondents, 86.5 of the ARNs are under 40 years of age. However, while the average age is younger than that of CRNAs, 72% of ARN respondents say they plan to retire within the next 10 years (Figures 2 and 3).

Both CRNAs and ARNs are likely to work more than the normal 40-hour workweek. For ARNs, 60.3% work 41 to 50 hours per week, 9.2% work 51 to 60 hours, and 2.8% work more than 61 hours per week. For CRNAs, 42.1% work 41 to 50 hours per week, 17.5% work 51 to 60 hours, and 7.1% work more than 61 hours (Figure 4). On average, ARNs performed less than 20 cases per week (42.6%). Similarly, 42.9% of CRNA respondents reported performing fewer than 20 cases per week. Figures 5 and 6 provide more specific information about the details of nurse anesthesia workload reported by respondents and the components of practice.

Chi-square analysis (2 × 2 tables) was conducted for 10 components of nurse anesthesia practice. Of those 10 components, 9 demonstrated statistically significant differences between CRNA and ARN respondents (Table 2, Figure 6).

Finally, a Kruskal-Wallis test was conducted to locate differences in work satisfaction between the 2 groups. There was a statistically significant difference in work satisfaction between CRNAs and ARNs (H (1) = 22.515, P < .01) with a mean rank of 109.07 (median = 3) for ARNs and a mean rank of 150.38 (median = 4) for CRNAs (Figure 7).
The practices of CRNAs and ARNs in South Korea demonstrate important differences that are likely the result of different levels of nurse anesthesia education and training. We have identified those practice components that are statistically significantly different and are related to the sophistication of clinical judgment and reasoning during the provision of care to individuals. The ARNs use more dependent-level skills, tasks, and judgments during the care they provide than do the CRNAs. The CRNAs’ practice is differentiated from ARN practice by more independent clinical judgment during the provision of care, making their practice more analogous to the practice of the anesthesiologist than the ARN.

Although the results demonstrate the independent nature of the CRNA practice, they also highlight the source of continuing interprofessional competition. Ambiguity of practice components and boundaries between CRNAs and anesthesiologists are highlighted by the differences in practice components between ARNs and CRNAs. It is legitimate to assume that although ARNs function in more dependent roles, the practice components that they do not perform are accomplished by anesthesiologists. These practice differences highlight the shared practice components between anesthesiologists and CRNAs.

In the United States, conflict over professional scope of practice and interprofessional boundaries are played out between professional organizations in the political arenas of each state between the Boards of Nursing and Medicine. However, the cultural differences between South Korea and the United States are great enough that conflicts over interprofessional boundaries are likely to be played out very differently and in less public forums.

Korean culture evolved along strict hierarchical lines over a 5,000-year period. Traditionally physicians were considered “professionals” and ranked higher in the hierarchy. Nurses were considered members of the “service” strata and ranked below physicians. All nurses deferred to physicians. In recent years, nurses are also considered as professionals. However, the old traditional social norms still influence modern society, and nurses still defer to physicians as their superiors. This is true of both ARNs and CRNAs.

Some of the most interesting data relate to the respondents’ ages and plans to retire from anesthesia practice. As stated earlier, 53.1% of CRNAs were over age 50 years, and 68.3% of them plan to retire from the practice within the next 10 years (see Figures 2 and 3). It is also interesting that, although the average age of the ARN workforce is much younger than the average age of CRNAs, many ARNs also plan to retire from anesthesia practice within the next 10 years.

The survey question asked about the respondents’ plans to retire from anesthesia practice. Because CRNAs are professional anesthesia providers, they likely will not leave the field until they reach retirement at around age 60 years, which is in line with the general Korean population. It is clear that the number of practicing CRNAs will decline severely as the current workforce reaches retirement age and is not replaced by the educational system. If

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Figure 6. Performance of Components of Anesthesia
Abbreviations: ARN, anesthesia registered nurse; CRNA, Certified Registered Nurse Anesthetist.
A. Pre-anesthetic assessment
B. Obtain anesthesia consent
C. Consult with physicians when making an anesthetic plan
D. Prepare and check anesthetic drugs, supplies, and anesthesia machine
E. Inject anesthetic drugs during induction
F. Insert endotracheal tube or laryngeal mask airway
G. Management of emergence from anesthesia and decision to remove airway devices
H. Postanesthesia airway and pain management
I. Perform regional block (spinal, epidural, nerve blocks)
J. Documentation of anesthesia record
universities do not train CRNAs at a rate commensurate with the attrition by retirement, CRNAs will eventually cease to exist as a part of the medical services workforce. On the other hand, many ARNs are not locked into anesthesia as a professional career. Some may choose to continue until retirement age, whereas others may opt to return to other nursing specialties before final retirement. Many of the ARNs surveyed cited lack of educational opportunities and lack of legal protection as their greatest professional concerns. On average, ARNs are likely to work equally long hours as CRNAs. These factors taken together may contribute to the lower rate of job satisfaction among ARNs.

**Conclusion**

The authors conclude there is support for greater work satisfaction among CRNAs than ARNs and that the increased satisfaction may be related to a more autonomous level of practice experienced by the CRNA. Studies in the United States demonstrate that highly educated nurse anesthetists can provide reliable, safe, and cost-effective anesthesia care.14,15 However, no studies could be located that address the relative safety of anesthesia services in South Korea, whether provided by ARNs, CRNAs, or anesthesiologists.

The current global trend is toward expanding the role of advanced nursing in collaboration with physicians to meet the demand for needed services. A logical course of action would be to establish a well-planned study to determine the safety and effectiveness of CRNA practice in South Korea. Such an approach would help both define the parameters of safe practice and suggest a legal scope of practice for CRNAs. Once CRNAs are established as safe and legal anesthesia providers, a path for ARNs to become CRNAs could be established. Allowing for cultural and professional needs and preferences, there may always be a role for the ARN to practice in South Korea. The challenge for KANA is to be proactive in developing national standards for education, certification, and practice so nurse anesthetists can practice as one united profession, free of interprofessional conflict and confusion of roles.

As the current practicing CRNAs age and retire, their numbers will dwindle. This will force medical facilities to train and utilize ARNs to meet the demand for nurse anesthesia services. Although we expect the CRNA numbers to decrease, ARNs will be needed in greater numbers. Simply put, CRNAs as a profession may virtually disappear from the workforce in Korea. The South Korean CRNA workforce is in danger of shrinking drastically over the next decade. As of the writing of this article, the last remaining program educating nurses for an advanced practice in nurse anesthesia has closed its program. As CRNA numbers dwindle, their ability to influence policy and training will also diminish.

The data also suggest that many current ARNs also plan to retire from anesthesia practice within the next 10 years. This means medical centers will need to ramp up their programs to train ARNs to meet the demand for nurse anesthesia services. If, over the next decade, the current rate of attrition for CRNAs continues and the education of advanced practice nurses in anesthesia fails to resume, South Korea is at risk of returning the practice of nurse anesthesia to its postwar status. We may well see the sun set on CRNA practice in South Korea.

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**Table 2.** Significant Performance Differences Between CRNAs and Anesthesia Registered Nurses

<table>
<thead>
<tr>
<th>Component of care</th>
<th>$\chi^2$</th>
<th>$P$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance of a preanesthesia assessment</td>
<td>7.133</td>
<td>.008</td>
</tr>
<tr>
<td>Obtaining consent for anesthesia</td>
<td>.655</td>
<td>.003</td>
</tr>
<tr>
<td>Collaborating with the anesthesiologist to create the anesthetic plan</td>
<td>39.361</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Administering anesthetic drugs</td>
<td>4.958</td>
<td>.026</td>
</tr>
<tr>
<td>Airway management</td>
<td>173.863</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Management of emergence from anesthesia</td>
<td>139.224</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Postanesthesia management of airway and pain</td>
<td>9.598</td>
<td>.002</td>
</tr>
<tr>
<td>Perform regional anesthesia blocks</td>
<td>15.992</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Documentation in the anesthesia record</td>
<td>96.568</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

**Figure 7.** Job Satisfaction

Abbreviations: ARN, anesthesia registered nurse; CRNA, Certified Registered Nurse Anesthetist.
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AUTHORS

Michong Rayborn, DNP, CRNA, is an assistant professor at the University of Southern Mississippi, Hattiesburg, Mississippi. Email: Michong rayborn@usm.edu.

Gyeseon Jeong, PhD, CRNA, is an associate professor in the Chosun College of Nursing, Kwang Ju, South Korea.

SatAnanda Hayden, PhD, MSN, RN, is an assistant professor at the University of Southern Mississippi.

Sungu Park, MPH, is a director of biostatics, Sun Biomed Co, South Korea.

DISCLOSURES

The authors have declared no financial relationships with any commercial entity related to the content of this article. The authors did not discuss off-label use within the article.