



# Measuring Clinical Reasoning and Interprofessional Attitudes

Emily Johnson, PhD<sup>1</sup>; Gretchen Seif, DPT<sup>2</sup>; Patty Coker-Bolt, PhD<sup>3</sup>; Sara Kraft, DPT<sup>2</sup>

<sup>1</sup>College of Nursing, Medical University of South Carolina, Charleston, South Carolina, USA

<sup>2</sup>College of Health Professions, Division of Physical Therapy, Medical University of South Carolina, Charleston, South Carolina, USA

<sup>3</sup>College of Health Professions, Division of Occupational Therapy, Medical University of South Carolina, Charleston, South Carolina, USA

**Corresponding Author:** Emily Johnson, PhD; email: johnsoem@musc.edu

**Published:** May 3, 2017

## Abstract

**Background:** Interprofessional learning, collaboration and clinical reasoning are vital in medical education and medical care in order to best meet the needs of today's patients. Student-run free clinics are a type of learning experience that can foster interprofessionalism and develop clinical reasoning skills. Ongoing evaluation of student attitudes, behaviors, and knowledge related to interprofessionalism and clinical reasoning are beneficial in order to continually improve education and curricula and maximize student learning outcomes. While numerous tools exist to measure student attitudes toward interprofessionalism and clinical reasoning skills, there is a lack of high quality measurement tools in this field.

**Methods:** This study completed an exploratory factor analysis of the Self-Assessment of Clinical Reflection and Reasoning (SACRR) and the Interprofessional Education Scale (IEPS) to develop a new shortened interprofessional and clinical reasoning evaluation tool to measure student perceptions of interprofessionalism and clinical reasoning skills.

**Results:** Factor analysis of SACRR yielded 4 factors, and RIPLS yielded 3 factors. In an overall exploratory factor analysis of SACRR and IEPS together, 11 significant factors emerged, with 5 of the factors having questions that loaded to them. Thirteen total questions loaded to each of the factors, forming the basis for a new survey tool.

**Conclusions:** This new shortened survey tool can be beneficial to measuring interprofessional student learning outcomes and enhancing medical education, thereby improving the overall quality of health care delivery.

## Background

Interprofessional (IP) education is becoming the standard in health care training, and students are exposed to IP values and clinical reasoning early in their training. IP education in the health care field occurs when students of two or more disciplines learn with and from each other to enhance knowledge, collaboration, and communication, and thus improve health outcomes. This field has a current emphasis on IP education because an IP health care environment has been shown to improve access to care, coordination of care, use of specialist resources, and overall patient safety and health outcomes.<sup>1</sup> Student-run free clinics (SRFC) are one example of how medical educators can incorporate IP education and clinical reasoning into

their curricula. In addition to SRFCs providing a valuable service to those that may not otherwise be able to afford care, there is evidence that they can provide students with the opportunity to develop valuable clinical skills.<sup>2</sup> These include student attitudes and behaviors toward interprofessionalism and clinical reasoning skills.

To understand the effectiveness of existing and new IP programs, it is important to measure the critical outcomes expected from IP training and clinical reasoning education in SRFCs. Various established surveys exist for measuring student perceptions and attitudes for both IP and clinical reasoning, such as the Self-Assessment of Clinical Reflection and Reasoning (SACRR), Interprofessional Education Scale (IEPS), and Readiness for Interprofessional Learning Scale (RIPLS). The SACRR

has been used in various health care student populations to measure student perceptions of their clinical reasoning.<sup>2,6</sup> However, there has been debate regarding the validity of all instruments.<sup>7-9</sup> Recent reviews of quantitative IP survey tools provide insight to the dearth of high quality assessments and have suggested that there is no 'gold standard' for evaluating IP learning.<sup>7,8</sup> Reasons for lack of ideal IP tools included lack of consistent vocabulary in this field, numerous factors related to IP that need to be analyzed, lack of agreement on which components of IP should be measured, and limited progress in developing psychometric properties of existing surveys.<sup>8</sup> Specifically, tools that lack information about psychometric properties make it difficult to determine validity.<sup>8</sup> The RIPLS survey has been the center of IP tool debate, and it has been illustrated that there is need for further adjustment and refinement of this tool.<sup>9,10</sup> Several other studies have shown a change in the overall readiness for IP education or an improvement in the IP perceptions after relatively short interventions; however, the scores were relatively high and the interventions were on students that had no prior IP experiences.<sup>11-14</sup> As IP attitudes become the standard among students in medical and allied health education, the tools used to evaluate student perceptions need to shift from assessment of student attitudes to measurement of how these attitudes translate into improved patient care.<sup>15</sup> In fact, a 2014 systematic review of IP education calls for the development of new assessment measures which are more sensitive towards understanding how different types of IP activities produce different types of outcomes within particular academic learning environments and how these processes lead to long-term behavioral and system changes.<sup>16</sup> In addition, each of the existing survey tools contains at least 18 questions and students can easily reach fatigue when asked to complete multiple lengthy surveys, which may result in invalid and non-reliable outcomes data.<sup>17</sup> A shortened IP and clinical reasoning learning evaluation survey tool will allow learning and attitude outcomes to be gleaned more efficiently, thereby minimizing student, faculty, and researcher time and improving validity and reliability.

The Community Aid, Relief, Education and Support Clinic (CARES) SRFC is sponsored by an academic medical center in the southeastern United States and is an example of an IP service-learning experience where students from multiple disciplines and colleges work together to learn from

each other while providing free medical care to the community. Since 2005, this service-learning experience has enhanced the clinical experience of medical, occupational therapy (OT), physical therapy (PT), pharmacy, and physician assistant (PA) students while providing much needed health care to the uninsured population in the South Carolina area and beyond. The CARES program has two IP clinics: a medical clinic and a PT/OT clinic. All students enrolled in an IP course at the medical university are required to participate as student clinicians in the CARES clinics. Student clinicians provide all care to the patients under the supervision and mentorship of licensed health care providers.

In a previous study from September 2011-April 2012, the authors of this manuscript examined the benefits of a SRFC as a service-learning experience for students in medicine, pharmacy, OT, and PT programs.<sup>2</sup> We hypothesized that students who participate in an IP service-learning course and volunteer at a SRFC would demonstrate significant increases in 1) perceptions and attitudes for working in IP health care teams and 2) clinical reasoning skills compared to students who did not participate. The IEPS, RIPLS, and SACRR were administered to an experimental group of pre-clinical students from each program (n=100) before and after participation in an IP service-learning course and volunteering at the SRFC. These assessments were also administered to a control group of students (n=232) who did not complete the service-learning course or volunteer at the SRFC.

We found that students who completed the course had improvements in IP behaviors and attitudes on the IEPS (p=0.03) and showed a statistically significant change in clinical reasoning skills when compared to the control group (p<0.01) on the SACRR. Engagement at a SRFC improves both IP attitudes as well as clinical reasoning skills in students from various allied health fields. Upon further analysis of the questions on all the tools, the authors found only a few questions from each survey showed statistically significant changes pre- and post-participation in the class. This lack of significant change in scores in all questions may be due to the fact that the surveys are not sensitive enough to measure group differences or may be due to a ceiling effect (2). Due to the lack of all questions showing significance and the time to complete three separate and lengthy surveys, the authors hypothesized that a shortened and combined version of these survey tools may be useful

for a SRFC to evaluate both IP attitudes and clinical reasoning. The primary aim of this study was to develop a new concise IP and clinical reasoning student survey tool, based off questions from the SACRR and IEPS, that would measure student perceptions of clinical reasoning skills and IP attitudes.

## Methods

### Data

The data utilized for this study was from our previous study, described above. This previous research identified changes in students' clinical reasoning and attitudes on IP education at an academic medical center in the southeastern United States. Students were from the colleges of Medicine, Pharmacy, and Health Professions Professions (PT, OT, PA). In the previous study, the experimental group volunteered regularly at the student-run free medical clinic, CARES and participated in an IP course within the university. The IP course, "Caring for the Community" is offered during the spring and fall semesters with students from the colleges of Medicine, Pharmacy and Health. The students meet weekly for various lectures, activities, and clinical skills practice. All students in the previous study were asked to complete the SACRR, IEPS, and RIPLS surveys before and after taking the interprofessional learning course. The participants consisted of 100 students in the experimental group (class students) that volunteered at one of the clinics and 232 students in the control group (did not take the class) and may or may not have volunteered at the clinic.

For the current study, the mean post-test scores of all questions for the SACRR and IEPS surveys were utilized in an exploratory factor analysis to determine the most relevant survey questions that could be utilized to determine student perceptions on clinical reasoning and interprofessionalism. The university's Institutional Review Board approved the current study.

### Self-Assessment of Clinical Reflection and Reasoning

The SACRR is a tool with 26 items rated on a five-point scale ranging from a 5, "strongly agree," to a 1, "strongly disagree." The tool is designed to assess students' perceptions of teaching methods on their clinical reflection and reasoning.<sup>3-6</sup> The psychometric properties of the SACRR using Chronbach's alpha demonstrate internal consistency scores of 0.87 pre-test and 0.92 for post-

test, and a Spearman rank order correlation coefficient for test-retest reliability is moderate with a score of 0.60.<sup>4,5,18</sup>

### The Interdisciplinary Education Perception Scale

The IEPS is an 18-item scale designed to measure student perception and attitudinal change following an experience rated on a six-point Likert scale. The IEPS can be sub-divided into four factors: competence and autonomy, perceived need for cooperation, perceptions of actual cooperation, and understanding others' values, with a range in maximal possible scores from 72-96 and the maximum total score is 330. The psychometric properties show an internal consistency ranging from  $r = 0.51$  to  $0.87$ .<sup>19,20</sup>

### Data Analysis

We performed an exploratory factor analysis on data from the mean post-test scores for each question from the SACRR, IEPS, and RIPLS separately. Factor analysis is utilized in order to understand a set of variables and reduce a large data set with multiple variables to a manageable size, while retaining relevant original variables.<sup>21</sup> The data was analyzed and an overall exploratory factor analysis was then also performed on all questions from the SACRR and IEPS surveys together. Due to the current discrepancies with the RIPLS survey tool and since a previous study found no meaningful differentiation in its survey questions, this tool was excluded from the main study analysis and SACRR and IEPS were solely utilized. Principal component analysis with varimax rotation was used for each analysis. The initial analysis yielded Eigen values for each question in the survey. Kaiser's criterion of 1.0 was used to limit Eigen values. All Eigen values that met these criteria were maintained for factors, and survey questions with factor loadings greater than or equal to 0.7 were used to label each factor. Statistical Analysis System (SAS) 9.3 was utilized for the analyses.

## Results

A factor analysis of SACRR yielded 4 factors which were labeled 'theory is useful for learning,' 'planning ahead is useful for interventions,' 'decisions are made based on experience,' and 'coping well with uncertainty.' Factor analysis of IEPS yielded 4 factors which were labeled 'respect for other professions,' 'professional status,' 'team work with other professions,' and 'ability of profession.' Factor analysis of RIPLS yielded 3 factors which

were labeled ‘team work with other professions,’ ‘shared learning is useful,’ and ‘communication between professions.’

When performing an overall exploratory factor analysis on the SACRR and IEPS together, the analysis yielded 11 significant factors, with 5 of the factors having questions that loaded to them. The factors and corresponding number of questions are located in Table 1.

Thirteen total questions loaded to each of the factors, as specified in Table 1. Table 2 lists the final survey questions for the newly developed survey measurement tool, based off the SACRR and IEPS. This exploratory factor analysis reduced 44 total established IP questions (26 SACRR and 18 IEPS) to a much more practical and feasible survey tool with 13 questions.

### Conclusions

This exploratory factor analysis of data from the SACRR and IEPS surveys provided a revised and shortened survey tool to measure changes in students’ clinical reasoning and IP attitudes following

participation in IP educational initiatives in conjunction with participation in a SRFC. This shortened survey tool could be more efficient in that it can help to avoid survey fatigue and can begin to capture attitudes related to interprofessionalism and clinical reasoning as supported by Thanhauser.<sup>8</sup> The results of the authors’ previous study highlight the difficulty using current validated assessments for measuring IP behaviors, attitudes, and perceptions of clinical reasoning and

**Table 1.** Factors from Exploratory Factor Analysis of SACRR and IEPS

Factor Label	Number of questions that loaded to each factor
Shared interprofessional learning is helpful	5
Theory is useful for learning	3
Professional Status	2
Inquiry directs practice	1
Change is tolerable	2

**Table 2.** Relevant Survey Questions from Factor Analysis

Survey	Question	Factor	Theme
SACRR	I question how, what, and why I do things in practice	10	Inquiry directs practice
SACRR	I look to theory for understanding a client’s problems and proposed solutions to them	4	Theory is useful for learning
SACRR	I use theory to understand treatment techniques	4	Theory is useful for learning
SACRR	I cope well with change	7	Change is tolerable
SACRR	I can function with uncertainty	7	Change is tolerable
SACRR	I use theory to understand intervention strategies	4	Theory is useful for learning
IEPS	Individuals in other professions respect the work done by my profession	5	Professional status
IEPS	Individuals in other professions think highly of my profession	5	Professional status
IEPS	Individuals in my profession make every effort to understand the capabilities and contributions of other professions	1	Shared interprofessional learning is helpful
IEPS	Individuals in my profession are willing to share information and resources with other professionals	1	Shared interprofessional learning is helpful
IEPS	Individuals in my profession have good relations with people in other professions	1	Shared interprofessional learning is helpful
IEPS	Individuals in my profession think highly of other related professions	1	Shared interprofessional learning is helpful
IEPS	Individuals in my profession work well together	1	Shared interprofessional learning is helpful

in demonstrating changes in attitudes due to student self-assessment, a possible ceiling effect, and the early introduction of IP education in the curriculum.<sup>2</sup> Institutions which embed IP educational opportunities through student participation in a SRFC and other opportunities throughout their curricula may have students with very high pre-test scores following completion of early IP initiatives, making measurement of subsequent changes after participation in additional IP programs difficult to assess using current measures. There is a need for a shortened IP assessment tool that may be more sensitive to changes in student attitudes and behaviors following completion of IP work at later stages of an educational program.

There is a need to develop a more robust measure of not only readiness for IP learning, but also how students perceive IP learning may change their clinical reasoning and, ultimately, the way they will deliver care to future patients. The newly developed tool should strive to examine whether IP education is really having a positive impact on patient care through improved clinical reasoning and should focus on the improvement of patient care through communication, teamwork, and safety, the ultimate goal of interprofessionalism. Abu-Rish et al.<sup>22</sup> stressed the need for more structured planning and development of IP activities. Thibault<sup>23</sup> supports the need for linking IP educational activities with an assessment of whether or not newly learned IP attitudes actually translate to better patient care and improved health outcomes. As IP education evolves from just improving IP attitudes to determining if IP education is actually leading to improved patient outcomes, the development of tools to determine if this is actually occurring is paramount. The SRFC is a distinct and unique student learning activity that can develop students' skills in both interprofessionalism and clinical reasoning.

It is a critical time in IP education and we must continue to develop measures of IP student learning that reflect the current Core Competencies for Interprofessional Collaborative Practice.<sup>24</sup> The Core Competencies were developed by an expert panel from nursing, osteopathic medicine, pharmacy, dental medicine, allopathic medicine, and public health as a "vision of IP collaborative practices as key to the safe, high quality, accessible, patient-centered care."<sup>24</sup> As our previous study revealed, students are readily demonstrating a willingness and inclination for IP learning early in their curricula and current measures are inadequate.<sup>2,23</sup> This readiness suggests that IP education has been

successful in exposing students to the ideas and concepts of interprofessionalism as described in the Core Competencies.<sup>24</sup>

Medical education should now strive to develop learning opportunities that would develop students further on the continuum described in the Core Competencies towards immersion (development of skills and behaviors) and competence (the integration of these skills into practice).<sup>24</sup> The SRFC is one of the ways that medical education can create these opportunities for students in all medical disciplines. Faculty that supervise and support SRFC need tools to evaluate whether or not the students are gaining the valuable skills of interprofessionalism and clinical reasoning. We believe that this factor analysis of data from the SACRR and IEPS surveys provides a revised, shortened, and potentially more efficient survey tool to measure changes in students' clinical reasoning and IP attitudes following participation in IP educational initiatives in a SRFC. Future research should focus on the development of a survey/tool that measures components of both interprofessionalism and clinical reasoning to improve overall patient care and outcomes.

#### *Limitations*

The data used for the analysis were from a convenience sample of students from a medical university, so this may represent selection bias. In addition, the method of factor analysis has an element of subjectivity. Lastly, only two IP surveys were used for this analysis. While we acknowledge that there are many more surveys in existence, we chose these two tools because of the wide use of these tools in the literature and as a secondary analysis to data we obtained from a previous study.

The tool we propose through this factor analysis is a more concise tool that incorporates two previously validated tools and combines two important constructs, interprofessionalism, and clinical reasoning. This new tool still needs to be validated and further examined to see if improvements in these areas actually improve overall patient care and outcomes. As IP education progresses, tools need to be developed that reflect more than just attitudes and perceptions and assess overall improvement in students' clinical skills and patient care in a SRFC.

#### **Disclosures**

The authors have no conflicts of interest to disclose.

## References

1. Strengthening nursing and midwifery. World Health Organization; 2011 May 24. 4p. Report No.: WHA64.7. Available from: [http://apps.who.int/gb/ebwha/pdf\\_files/WHA64/A64\\_R7-en.pdf?ua=1](http://apps.who.int/gb/ebwha/pdf_files/WHA64/A64_R7-en.pdf?ua=1). [LINK](#)
2. Seif G, Coker-bolt P, Kraft S, Gonsalves W, Simpson K, Johnson E. The development of clinical reasoning and interprofessional behaviors: service-learning at a student-run free clinic. *J Interprof Care*. 2014;28(6):559-64. [LINK](#)
3. Coker P. Effects of an Experiential Learning Program on the Clinical Reasoning and Critical Thinking Skills of Occupational Therapy Students. *J Allied Health*. 2010;39(4):280-6. [LINK](#)
4. Musolino G, Mostrom E. Reflection and the scholarship of teaching, learning, and assessment. *J Phys Ther Educ*. 2005;19(3):52. [LINK](#)
5. Royeen C, Mu K, Barrett L, Luebben A. Pilot investigations: Evaluation of a clinical reflection and reasoning before and after workshop intervention. In: Crist P, editor. *Innovations in Occupational Therapy Education*. Bethesda, MD: American Occupational Therapy Association; 2001. p. 107-14.
6. Scaffa M, Wooster D. Effects of problem-based learning on clinical reasoning in occupational therapy. *Am J of Occup Ther*. 2004;58(3):333. [LINK](#)
7. Gillan C, Lovrics E, Halpern E, Wiljer D, Harnett N. The evaluation of learner outcomes in interprofessional continuing education: a literature review and an analysis of survey instruments. *Med Teach*. 2011;33:461-70. [LINK](#)
8. Thannhauser J, Russell-Mayhew S, Scott C. Measures of interprofessional education and collaboration. *J Interprof Care*. 2010;24(4):336-49. [LINK](#)
9. Williams B, Brown T, Boyle M. Construct validation of the readiness for interprofessional learning scale: a Rasch and factor analysis. *J Interprof Care*. 2012;26:326-32. [LINK](#)
10. Wilhelmsson M, Ponzer S, Dahlgren L, Timpka T, Faresjo T. Are female students in general and nursing students more ready for teamwork and interprofessional collaboration in healthcare? *BMC Med Educ*. 2011;11:15. [LINK](#)
11. Giordano C, Umland E, Lyons K. Attitudes of Faculty and Students in Medicine and the Health Professions toward Interprofessional Education. *J Allied Health*. 2012;41(1):21-5. [LINK](#)
12. Hayashi T, Shinozaki H, Makino T, Ogawara H, Asakawa Y, Iwasaki K, et al. Changes in attitudes toward interprofessional health care teams and education in the first- and third-year undergraduate students. *J Interprof Care*. 2012;26(2):100-7. [LINK](#)
13. Hertweck M, Hawkins S, Bednarek M, Goreczny A, Schreiber J, Sterrett S. Attitudes toward interprofessional education: comparing physician assistant and other health care professions students. *J Physician Assist Educ*. 2012;23(2):8-15. [LINK](#)
14. Wellmon R, Gilin B, Knauss L, Linn M. Changes in Student Attitudes Toward Interprofessional Learning and Collaboration Arising from a Case-based Educational Experience. *J Allied Health*. 2012;41(1):26-34. [LINK](#)
15. Functions and Structure of a Medical School: Standards for Accreditation of Medical Education Programs Leading to the M.D. Degree. Liaison Committee on Medical Education; 2012 May. 31p. [LINK](#)
16. Olson R, Bialocerkowski A. Interprofessional education in allied health: a systematic review. *Med Educ*. 2014;48:236-46. [LINK](#)
17. Porter S, Whitcomb M, Weitzer W. Multiple surveys of students and survey fatigue. *New Dir for Inst Res*. 2004;121:63-73. [LINK](#)
18. Roth R. Preparing the reflective practitioner: Transforming the apprentice through the dialectic. *J Teach Educ*. 1989;40(2):31-5. [LINK](#)
19. Luecht R, Madsen M, Taugher M, Petterson B. Assessing professional perceptions: design and validation of an Interdisciplinary Education Perception Scale. *J Allied Health*. 1990;19(2):181-91. [LINK](#)
20. Page R, Hume A, Trujillo J, Leader W, Vardeny O, Neuhauer M, et al. *Interprofessional Education: Principles and Application A Framework for Clinical Pharmacy. Pharmacotherapy*. 2009;29(7):879. [LINK](#)
21. Field A, Miles J. *Discovering Statistics Using SAS*. London: Sage Publications; 2010.
22. Abu-Rish E, Kim S, Choe L, Varpio L, Malik E, White A, et al. Current trends in interprofessional education of health sciences students: a literature review. *J Interprof Care*. 2012;26(6):444-51. [LINK](#)
23. Thibault G. Interprofessional education in the USA: current activities and future directions. *J InterprofCare*. 2012;26(6):440-1. [LINK](#)
24. Interprofessional Education Collaborative Expert Panel. *Core Competencies for Interprofessional Collaborative Practice: Report of an Expert Panel*; 2011. 56 p. [LINK](#)