

Table 3: *Evaluation of Informatics Competencies (IC) Tools*

Study	Target <i>population</i>	Development <i>(length, complexity # of items</i>	Criteria			Comments
			Reliability	Validity	Practicality/ Feasibility	
(1) Staggers, Gassert, & Curran (2001) IC for nurses at 4 practice levels	Nurses at 4 practice level (1-beginning nurses, 2- experienced nurses, 3- informatics specialist, 4- informatics innovators)	list developed & used to identify the categories of statements across four level of practice. Included 313 IC , shortened to 304 IC agreed on by expert panel	<u>Stability:</u> Yes- Retested by Delphi study. <u>Internal consistency</u> No, Cronbach's alpha reported <u>Equivalence:</u> Yes, 80% threshold of agreement of expert panel	<u>Content validity:</u> Yes, based on experts' agreement <u>Criterion validity:</u> No, Statistics not done <u>Construct validity:</u> Yes, relationship based on theoretical predictions.	Very long list Gave details of needed informatics skills & knowledge for each level	Categories: computer skill, informatics knowledge and informatics skill at different levels of practice Tool used by Staggers, Gassert, & Curran (2002).
(2) Staggers, Gassert, & Curran (2002)	Nurses at 4 practice levels (1-beginning nurses, 2- experienced nurses, 3- informatics specialist, 4-	304 competencies developed by Staggers, Gassert, & Curran 2001 used as questionnaire. 281 competencies short listed -	<u>Stability:</u> Yes , retested through pilot test and by Chung & Staggers, 2014 <u>Internal consistency</u>	<u>Content validity:</u> Yes, Based on experts' agreement <u>Criterion validity:</u> No, Statistics was not done	Long list of competencies Nurses may feel response burden	Same group of researchers (Staggers, Gassert, & Curran, 2001) Tool used by Westra & White-

IC for nurses at four practice levels	informatics innovators)	achieved 80% agreement 24 competencies were rejected	No, Cronbach's alpha not reported		<u>Construct validity:</u> Yes, Relationship based on theoretical predictions.	All items written in clear & understandable language	Delaney (2008), Hart (2010), & Chang, Poynton, Gassert, & Staggers (2011)
			<u>Equivalence:</u> Yes, used 80% threshold of agreement of expert panel				

(3) Westra & White-Delaney, (2008)	Nurse leader	include 119 IC (38 computer skill, 37 informatics knowledge, 44 informatics skill) The results of Delphi rounds resulted in 92 IC (24 computer skill, 40 informatics knowledge, 28 informatics skill).	<u>Stability:</u> Test/retest not done <u>Internal consistency:</u> No, Cronbach's alpha not reported <u>Equivalence:</u> Yes, 80% threshold of agreement of expert panel	<u>Content validity:</u> Yes, Content validity index (CVI) was calculated but not reported <u>Criterion validity:</u> No, statistics not done <u>Construct validity:</u> Yes Relationship based on theoretical predictions.	Long list of competencies Detailed list under each category Nurses may feel response burden Items clear & understandable language	Tool unique for nurse leaders (front line nurse manager to the nursing executive). Tool developed based on Staggers, Gassert, & Curran (2002) & two other studies (American Organization of Nurse Executives (2005) & Association of College & research Libraries, (2008). No other studies used this tool.
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<p>(4) TIGER IC Collaborative team (TICC) (2009)</p> <p>TIGER nursing IC model</p>	<p>Nurses</p>	<p>> 1000 competencies statements reviewed & evaluated. Final list = 231 IC (108 basic computer competencies, 47 information-literacy competencies, and 76 information management competencies).</p>	<p><u>Stability:</u> Yes</p> <p>Retested by Jensen, Souza, & Leite' 2016; Hunter, McGonigle, & Hebda, 2013 ; Hunter et al., 2015</p> <p><u>Internal consistency:</u> No,</p> <p>Cronbach's alpha not done</p> <p><u>Equivalence:</u> results of Inter-observer reliability or index of equivalence or level of agreement not reported.</p>	<p><u>Content validity:</u> Yes -CVI ranging from 0.52 – 0.75 done Hunter, McGonigle, & Hebda, 2013</p> <p><u>Criterion validity:</u> No, Stats.not done</p> <p><u>Construct validity:</u> Yes, relationship based on theoretical predictions.</p>	<p>Very long list of competencies with</p> <p>Detailed list under each category</p> <p>Nurses may feel response burden</p> <p>items written in clear & understandable language</p> <p>General IC that did not demonstrate the accepted competencies for different level of nursing practice.</p>	<p>Tool based on European Computer Driver License, American Library Association's information-literacy standards, Electronic health-record-system functional model's direct-care components</p> <p>Used in two studies (Hubner, et al., 2016; Hunter, McGonigle, & Hebda, 2013)</p>
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(5) Hart (2010)	Nurse managers	Initial of 69 IC reviewed in three Delphi rounds. Final 49 IC informatics selected (24 computer skill, 40 informatics knowledge, 28 informatics skill).	<u>Stability:</u> Yes, retested by Yang, et al., 2014. <u>Internal consistency:</u> Yes, Cronbach's α , > 0.85 done by Yang, et al. (2014). <u>Equivalence:</u> Yes, 75% threshold of agreement of expert panel	<u>Content validity:</u> Yes, by expert agreement <u>Criterion validity:</u> Yes, R= 0.844 done by Yang, et al. (2014). <u>Construct validity:</u> Yes, relationship based on theoretical predictions.	Tool specific for nurse managers List available in Hart (2010b) Witten in understandable language & acceptable length. Tool validated by Yang, et al. (2014)	IC for nurse manager composed from level 1 & 2 Based on Stagers, Gassert, & Curran (2002). Tool reused by Yang, et al. (2014).
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<p>(6) Chang, Poynton, Gassert, & Staggers, (2011),</p>	<p>nurses</p>	<p>323 IC (based on 281 IC from Staggers, Gassert, & Curran, 2002 and 42 IC derived from updated literatures) were reviewed in Delphi rounds.</p>	<p><u>Stability:</u> Yes, retested by Chung & Staggers, 2014.</p>	<p><u>Content validity:</u> Yes, content evaluated based on agreement of nursing informatics experts</p>	<p>Very long list of IC with detailed list under each category.</p>	<p>This tool based on Staggers, Gassert, & Curran, 2002.</p>
<p>Nursing informatics competencies required of nurses in Taiwan</p>		<p>318 IC achieved expert agreement.</p>	<p><u>Internal consistency:</u> Yes, Cronbach's $\alpha = .981$ (Chung & Staggers, 2014)</p>	<p><u>Criterion validity:</u> Yes, Chung & Staggers (2014) conducted statistics $R > 0.90$</p>	<p>Chung & Staggers (2014) used only level 1 & 2 in their study.</p>	<p>Chung & Staggers (2014) used this tool to measure full set of IC</p>
			<p><u>Equivalence:</u> Yes, 60% threshold of agreement of expert panel</p>	<p><u>Construct validity:</u> Yes, relationship based on theoretical predictions.</p>	<p>List available in Chang (2007) & Written in understandable language.</p>	

<p>(7) Hunter, McGonigle, & Hebda (2013)</p> <p>Self-assessment of perceived nursing IC</p>	<p>Students, Nursing faculty, Nurses.</p>	<p>231 IC (based on TIGER, 2009) used as self-assessment questionnaire.</p> <p>Final IC list approved included 85 competencies (51 basic computer competencies, 25 information-literacy competencies, 9 clinical information management competencies).</p>	<p><u>Stability:</u> Yes</p> <p>retested when pilot test was conducted</p> <p><u>Internal consistency:</u></p> <p>Yes , Cronbach's α done for each set: Basic computer skill= .95, Information literacy = .98, Clinical information management= .94 (Hunter et al., 2015)</p> <p><u>Equivalence:</u> No</p> <p>results of Inter-observer reliability or index of equivalence or level of agreement not reported</p>	<p><u>Content validity:</u></p> <p>Yes, Content validity Index = 1</p> <p><u>Criterion validity:</u></p> <p>No, Stats. not done</p> <p><u>Construct validity:</u></p> <p>Yes, relationship based on theoretical predictions.</p>	<p>Long list of IC with detailed list under each category</p> <p>Nurses may feel response burden</p> <p>All items written in clear & understandable language</p> <p>General IC that did not demonstrate accepted competencies for different levels of nursing practice</p>	<p>Tool based on TIGER competencies</p> <p>Researchers aimed to revise the original list of TIGER competencies</p> <p>No other studies used this tool.</p> <p>The authors recommend using this tool with diverse groups (students, nurses in health care, and faculty).</p>
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(8) Hubner, et al., 2016	Nurses in various positions	List of 24 core IC used as questionnaire.	<u>Stability:</u> Yes, Test & retest done. Pretest & survey to evaluate the tool	<u>Content validity:</u> Yes, based on agreement of experts from TIGER international community	Presented different and acceptable IC for 5 level of nursing practice including clinical nursing & nursing management.	Tool based on the literature and included TIGER competencies list
Core IC for nurses		6 core IC in 5 areas, (clinical nursing, quality management, inter-professional coordination, nursing management, & IT management) were approved.	<u>Internal consistency:</u> No, Cronbach's alpha not reported	<u>Criterion validity:</u> No, stats. not done	Written in understandable language. Acceptable length but did not provide detailed items under each core competencies.	First international study to identify core IC for nurses in different roles
			<u>Equivalence:</u> Yes 50% threshold of expert agreement	<u>Construct validity:</u> Yes, relationship based on theoretical predictions.		No other studies retested this tool

SOURCE: A Review of Informatics Competencies Tools for Nurses and Nurse Managers, *Canadian Journal of Nursing Informatics*, 13(1), Winter 2018 <http://cjni.net/journal/?p=5370>

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