Measurement and Analysis of Individualized Care Inventory Responses Comparing Long-Term Care Nurses and Care Aides

Norm O’Rourke, PhD, RPsych, Neena L. Chappell, PhD, FRSC, CRC, and Sienna Caspar, MA

Purpose: Motivating and enabling formal caregivers to provide individualized resident care has become an increasingly important objective in long-term care (LTC) facilities. The current study set out to examine the structure of responses to the individualized care inventory (ICI). Design and Methods: Samples of 242 registered nurses (RNs)/licensed practical nurses (LPNs) and 326 care aides were recruited from 54 LTC facilities in 3 of 5 British Columbia health authorities. Baseline confirmatory factor analytic (CFA) models were computed separately for RNs/LPNs and care aides; invariance analyses were next undertaken to compare these CFA models. Results: For both RNs/LPNs and care aides, support was found for a 4-factor model of ICI responses mapping onto a higher order individualized care (IC) construct. This model was largely equivalent between formal caregiver groups, although the relative contribution of certain first-order factors differed between the two. Of further note, both groups appear to interpret and respond to 31 of 35 ICI items in a similar manner. Implications: The results of this study provide further support for the psychometric properties of ICI responses. Although further research is required, the ICI appears to be an appropriate self-report measure. This instrument may be used by researchers, policymakers, administrators, and practitioners alike to assess strengths as well as areas for improving the delivery of IC to LTC residents by formal caregivers.

Key Words: Dementia care, Formal caregivers, Individualized care, Long-term care, Scale reliability, Scale validation

Individualized care (IC), also known as client-centered, resident-directed, psychosocial, and flexible care, has been described as the model of choice for residents in long-term care (LTC) facilities (Calkins, 2001; Suñon, Valimake, & Katajisto, 2000). Yet, inconsistent operational definitions of this construct have impeded development of psychometrically sound measures. Recently, however, Chappell, Reid, and Gish (2007) developed a self-report instrument for LTC staff measuring distinct facets of IC; thus far, responses to this measure have demonstrated acceptable reliability. This brief report presents new data on the latent structure of this Individualized Care Inventory (ICI), comparing responses between registered nurses (RNs)/licensed practical nurses (LPNs) and care aides, and providing further psychometric support for its use by researchers and
facility administrators wishing to improve care (e.g., pre- and postintervention measurement).

The ICI was established through a review of the literature, direct observation of care within LTC facilities, and ongoing consultation with an expert panel. Six facets were identified: knowing the resident, opportunity for autonomy and choice for the resident, open communication between staff members and with residents, family involvement, residents connecting with others during activity programming and in day-to-day life, and a home-like physical environment. Support for the two family involvement facets has previously been reported by Reid, Chappell, and Gish (2007). Initial research suggests acceptable reliability of responses to the remaining four (Chappell, Reid, & Gish, 2007).

The current brief report compares ICI responses between RNs/LPNs and care aides. As recently noted by Caspar and O’Rourke (2008), RNs and LPNs have relatively more education and higher salaries yet have less resident contact than care aides. There are, in other words, sound reasons to examine whether the structure of responses to the ICI differs between these occupational groups. More precisely, the current study was undertaken to examine the structure of ICI responses for both RNs/LPNs and care aides, to ascertain whether the structure of responses is invariant (or equivalent) between the two, and to determine if both groupings of formal care providers interpret and respond to ICI items in a similar manner.

Methods

Participants

Convenience samples of RNs/LPNs and care aides were recruited from 54 LTC facilities within three of five health authorities (or regions) in British Columbia (BC) as part of a larger study of staff empowerment and IC (N = 568). To be eligible, participants were required to work on a permanent full-time or part-time basis (or as a casual in an equivalent position), be proficient in English, and have been employed in that facility for a minimum of 6 months.

RN and LPN were categorized together based on two initiatives implemented in BC due to RN shortages: the Ministry of Health’s initiative enabling LPNs to function in a full scope of practice capacity (Harvey, Sams, Bosancic, & Brunke, 2003) and a strategy developed to replace the majority of RNs working in LTC facilities with LPNs (Greenlaw, 2003). Both initiatives had been fully implemented prior to this study; as a result, LPNs and RNs now have similar roles and responsibilities within LTC (i.e., team leaders and supervision of care aides), although differences in skill and experience may persist. Specific to ICI responses, however, no between-groups differences were observed for any of the subscales or combined ICI responses, Hotelling’s T = .01, F(4,237) = .53, ns. Based on these findings and the initiatives previously described, RNs’ and LPNs’ responses were combined for subsequent analyses.

Surveys were completed by respondents working in facilities where managers agreed to allow their staff to be approached to participate (n = 31) as well as at off-site educational sessions completed by participants working in facilities where managers either did not respond or refused to enable on-site participation (n = 23). The most common reasons for refusal were a reported lack of time or resources.

All administrators were asked to provide descriptive facility information even when we were not invited to collect data on-site. Of note, there were no significant differences between consenting and nonconsenting facilities in terms of day- or nighttime staffing ratios; nor did consenting and nonconsenting facilities differ in numbers of residents, t(43) = .02, ns; unionization of care staff, χ²(df = 1) = .57, ns; or facility ownership (i.e., public, private not for profit, private for profit), χ²(df = 2) = 5.32, ns.

Responses to study variables were also compared between participants recruited within consenting facilities and those who provided data at off-site educational sessions. Of note, there were no significant IC response differences between RNs/LPNs or care aides working in consenting and nonconsenting facilities, t(223) = 1.88, ns, and t(324) = .92, ns, respectively. These findings suggest that neither facility features nor reported ability to provide IC differ as a result of administrators’ willingness to facilitate this study. That is, administrators did not appear to bias responses (via consent or refusal), providing greater confidence in the generalizability of findings.

Individualized Care Inventory

The ICI (Chappell et al., 2007) is a 34-item scale with responses provided along a 4-point Likert-type key. The ICI consists of four subscales: know residents (IC-KNOW, 11 items), resident autonomy (IC-AUTONOMY, 11 items), communication...
staff–staff (IC-COMMUNICATION-SS, 10 items), and communication staff–resident (IC-COMMUNICATION-SR, 3 items). Reported internal consistency of responses as measured by Cronbach’s alpha is within acceptable to good range for IC-KNOW ($\alpha = .77$), IC-AUTONOMY ($\alpha = .80$), and IC-COMMUNICATION-SS ($\alpha = .84$). A somewhat suboptimal coefficient has been reported for IC-COMMUNICATION-SR ($\alpha = .67$) possibly due to the small number of items (three) within this subscale. As noted by O’Rourke, Hatch-er, and Stepanski (2005), internal consistency can be underestimated with fewer than eight items.

**Results**

The order of questionnaire presentation was randomized creating two counterbalanced formats. Comparative analyses indicated that response levels did not significantly differ between groups for any of the four ICI subscales; it is thus unlikely that order effects confounded participant responses. Table 1 provides descriptive information for responses to study measures (e.g., internal consistency, univariate normality) for RNs (n = 242)/LPNs (n = 65) and care aides recruited for this study (n = 326).

<table>
<thead>
<tr>
<th>ICI responses</th>
<th>M</th>
<th>SD</th>
<th>Range</th>
<th>$\alpha$</th>
<th>Kurtosis</th>
<th>Skewness</th>
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<tbody>
<tr>
<td><strong>RNs/LPNs (n = 242)</strong></td>
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<td></td>
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<td></td>
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<tr>
<td>Know residents</td>
<td>34.99</td>
<td>4.55</td>
<td>22–44</td>
<td>0.74</td>
<td>-0.45</td>
<td>-0.07</td>
</tr>
<tr>
<td>Autonomy</td>
<td>34.97</td>
<td>6.02</td>
<td>18–55</td>
<td>0.81</td>
<td>0.02</td>
<td>0.07</td>
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<tr>
<td>Staff–staff communication</td>
<td>31.17</td>
<td>4.53</td>
<td>16–40</td>
<td>0.82</td>
<td>0.25</td>
<td>-0.35</td>
</tr>
<tr>
<td>Staff–resident communication</td>
<td>8.41</td>
<td>1.80</td>
<td>4–12</td>
<td>0.68</td>
<td>-0.45</td>
<td>0.16</td>
</tr>
<tr>
<td><strong>Care aides (n = 326)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Know residents</td>
<td>34.15</td>
<td>5.05</td>
<td>16–44</td>
<td>0.74</td>
<td>-0.05</td>
<td>-0.18</td>
</tr>
<tr>
<td>Autonomy</td>
<td>34.99</td>
<td>6.36</td>
<td>18–54</td>
<td>0.77</td>
<td>0.02</td>
<td>0.11</td>
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<td>Staff–staff communication</td>
<td>31.10</td>
<td>5.47</td>
<td>13–40</td>
<td>0.86</td>
<td>-0.44</td>
<td>-0.34</td>
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<tr>
<td>Staff–resident communication</td>
<td>9.22</td>
<td>2.02</td>
<td>3–12</td>
<td>0.74</td>
<td>-0.35</td>
<td>-0.37</td>
</tr>
</tbody>
</table>

Note: ICI = individualized care inventory; RN = registered nurse; LPN = licensed practical nurses.

Assessment of Between-Group Response Levels

Between-groups analyses were first computed to compare response levels between RNs/LPNs and care aides. There was an overall statistically significant between-group difference in responses to the ICI, Hotelling’s $T = .08, F(4, 563) = 11.26, p < .01$. Additional analyses indicate that the only univariate difference to attain significance (Bonferroni adjusted alpha = .01) was IC staff–resident communication, $F(1, 566) = 24.56, p < .01$, partial $\eta^2 = .04$. Care aides reported somewhat higher levels of IC staff–resident communication ($M = 9.22, SD = 2.02$) than RNs/LPNs ($M = 8.41, SD = 1.08$).

Baseline CFA Models

Separate CFA models were computed for RNs/LPNs and care aides based on the assumed structure in which items loaded upon one of four a priori first-order factors (i.e., know the resident, resident autonomy, staff-to-resident communication, staff-to-staff communication). Each of these four factors was assumed to significantly contribute to measurement of a higher order IC latent construct. Support for this measurement model has previously been reported (Casper & O’Rourke, 2008). CFA models were computed with the AMOS 16.0 statistical program using the maximum likelihood method of parameter estimation.

Care Aides CFA Model.—The CFA model was first computed for care aides (n = 326). Statistical power was .99 for this model according to the formula provided by MacCallum, Browne, and Sugawara (1996). All items with the exception of ICA07 loaded significantly upon their respective factors (i.e., $t$ values $> 1.96$). This resident autonomy item (“Do you generally feel that you have done things for residents when they could have done it for themselves?”) was deleted from the care aides’ CFA model for all subsequent analyses. For care aides, it would seem that this item is unrelated to measurement of resident autonomy.

Each of the four first-order factors contributed significantly to measurement of an overarching higher order construct. As presented in Figure 1, the know the resident factor provided the greatest contribution to measurement of this second-order...
construct, followed by staff-to-staff communication, resident communication, and resident autonomy.

Correction was made for correlated error between related item pairs based on AMOS modification indexes (also known as Lagrange multipliers; Byrne, 2001). The CFA model for care aides subsequently indicated effective fit of data, \( \chi^2(\text{df} = 472) = 521.75, p > .05 \). In accord with the significance thresholds suggested by Hu and Bentler (1999), the Comparative Fit Index (CFI) is within optimal parameters.

Figure 1. Confirmatory factor analysis of care aide individualized care instrument responses (n = 326). Note. Maximum likelihood estimates (standardized solution and significance levels). Asterisks (*) denote parameters initially fixed to 1.0 for purposes of scaling and statistical identification, thus significance levels cannot be computed for these five parameters. Numbers in parentheses indicate significance levels (statistically significant t values > 1.96).
(i.e., CFI > .95; CFI = .99) as are the Adjusted Goodness-of-Fit Index (AGFI; i.e., AGFI ≥ .90, AGFI = .90) and the Root Mean Square Error of Approximation (i.e., RMSEA < .05, RMSEA = .018). Of note, the full 90% confidence interval (CL90) for the RMSEA statistic is within optimal parameters (.00 ≥ RMSEA CL90 ≥ .027).

**RNs/LPNs CFA Model.**—The CFA model was next computed for RNs/LPNs. Although the sample size for this grouping was somewhat smaller (i.e., n = 242), statistical power was the same as for care aides (i.e., power = .99; MacCallum et al., 1996). All items contributed significantly to measurement of their respective first-order factors, which, in turn, contributed significantly to measurement of the overarching IC latent construct (see Figure 2). Among RNs/LPNs, the know the resident for RNs/LPNs. Among care aides, however, this factor emerged as least important (although a statistically significant component of IC). This finding is notable given the relative importance of staff-to-resident communication as reported by care aides in terms of both response levels as well as the contribution to IC measurement by this first-order construct.

**Comparison of Factor Structures.**—Subsequent to establishing baseline CFA models, care aide and RN/LPN models were next compared to ascertain the similarity of solutions. Comparison was undertaken as a partial test of measurement invariance in this instance due to deletion of item ICA07 from the care aide model. In other words, no equality constraint was imposed on this parameter due to between-group differences in the computation of baseline models (Byrne, Shavelson, & Muthén, 1989).

Factor structures were first compared to determine if the four-factor solution mapping onto a second-order construct is equivalent between groups. This solution emerged as viable, suggesting that the structure of ICI responses may best be measured by a four-factor solution with each of these mapping onto a higher order construct, \( \chi^2(df = 965) = 1034.21, ns \); CFI = .99, AGFI = .88, RMSEA = .011, .000 ≥ RMSEA CL90 ≥ .017 (see Table 2). This finding suggests that the basic latent structure of responses is equivalent for both care aides and RNs/LPNs. These initial comparisons, however, do not tell us if the strength of association between constructs is statistically equivalent. This was next examined, comparing parameter estimates between first- and second-order constructs.

**Invariance Analyses**

**Invariance of Factor Loadings.**—The strength of association between the ICI factors contributing to measurement of the overarching IC second-order construct was next examined. Although parameter estimates linking staff-to-staff communication and IC are indistinguishable between groups, \( \Delta\chi^2(\Delta df = 1) = 2.31, ns \), statistically significant differences were observed for others. More precisely, the contribution of staff-to-resident communication to measurement of IC is significantly greater for care aides than RNs/LPNs, \( \Delta\chi^2(\Delta df = 1) = 3.92, p < .05 \). Even more pronounced is the between-group difference in the contribution of resident autonomy to IC, \( \Delta\chi^2(\Delta df = 1) = 9.77, p < .01 \) (see Table 2). As previously noted, the strength of association between resident autonomy and IC was second only to know the resident for RNs/LPNs. Among care aides, however, this factor emerged as least important (although a statistically significant component of IC). This finding is notable given the relative importance of staff-to-resident communication as reported by care aides in terms of both response levels as well as the contribution to IC measurement by this first-order construct. Overall, these findings suggest similarity in terms of the structure of ICI responses across formal caregiver groups, although differences in the relative association between first- and second-order constructs are significant.

**Item Analyses.**—The preceding analyses provide support for the factorial validity of responses to the ICI. The final set of invariance analyses were undertaken to ascertain if RNs/LPNs and care aides interpreted and responded to ICI items in a similar manner. This appears to be the case for
each know the resident item, $\Delta \chi^2(\Delta df = 10) = 18.07$, ns; staff-to-resident communication items, $\Delta \chi^2(\Delta df = 2) = 5.74$, ns; staff-to-staff communication items, $\Delta \chi^2(\Delta df = 9) = 14.55$, ns; and most resident autonomy items, $\Delta \chi^2(\Delta df = 6) = 5.45$, ns. As reported in Table 2, statistically significant response differences were observed for the remaining three resident autonomy items, $\Delta \chi^2(\Delta df = 3) = 20.70$, $p < .01$. Although the relative weight of factors differed for staff-to-resident communication,
this does not appear attributable to between-group response differences to items measuring this first-order construct.

Overall, item analyses suggest that care aides and RNs/LPNs interpret and respond to 31 of 35 ICI items in a similar manner (excluding ICA07 from the care aide CFA model and item analyses). In addition to previous findings supporting the underlying structure of responses between these caregiver groups, item analyses suggest reliability of measurement.

**Conclusions and Discussion**

The results of this study provide additional support for this measure assessing formal caregivers’ reported ability to provide individualized care to LTC residents (Chappell et al., 2007). This instrument appears suitable for use with both RNs/LPNs and care aides, both caregiver groups appear to interpret and respond to the majority of ICI items in a similar manner.

Generalizability of study findings is limited by various factors, however. First, only participants who worked in LTC facilities in three of five BC health authorities were recruited for this study. In addition, differences between formal care providers who agreed to participate in this study versus those who declined cannot be ascertained. Also, responses to the two family subscales were not examined. This was not feasible for this study as participant responses must be from the same respondents (to all scales) to undertake analysis of covariance structures (e.g., CFA, invariance analyses). Of further note, representative caregiver samples were not recruited for this study. We are thus unable to generalize individualized care response levels to the overall population of formal caregivers in this province (e.g., norms for subscales). That was not the intent of this study; instead, models and invariance analyses were computed to examine the structure of ICI responses. Recruitment of convenience samples underscores the need to replicate these findings with formal caregivers derived from other jurisdictions (e.g., where universal health care does not yet exist); however, these findings add to a growing body of research providing support for the psychometric properties of ICI responses (Casper & O’Rourke, 2008; Chappell et al., 2007). This instrument appears to be a scientifically acceptable self-report measure of formal caregivers’ reported ability to provide individualized care to LTC residents.

### Table 2. Summary of Specifications and Fit Statistics for Invariance Analyses

<table>
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<tr>
<th>Successive constraints applied</th>
<th>$\chi^2$</th>
<th>$df$</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta df$</th>
<th>CFI</th>
<th>AGFI</th>
<th>RMSEA (RMSEA CL90)</th>
</tr>
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<tbody>
<tr>
<td>Unconstrained structural model</td>
<td>1034.21</td>
<td>965</td>
<td>—</td>
<td>—</td>
<td>.99</td>
<td>.88</td>
<td>.011 (.000 – .017)</td>
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<tr>
<td>Resident communication upon individualized care</td>
<td>1038.13</td>
<td>966</td>
<td>3.92*</td>
<td>1</td>
<td>.99</td>
<td>.88</td>
<td>.011 (.000 – .017)</td>
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<tr>
<td>Resident autonomy upon individualized care</td>
<td>1047.90</td>
<td>967</td>
<td>9.77**</td>
<td>1</td>
<td>.99</td>
<td>.88</td>
<td>.012 (.004 – .017)</td>
</tr>
<tr>
<td>Staff–staff communication upon individualized care</td>
<td>1050.03</td>
<td>968</td>
<td>2.13</td>
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<td>.99</td>
<td>.88</td>
<td>.012 (.004 – .017)</td>
</tr>
<tr>
<td>Know-the-resident items upon latent variable</td>
<td>1068.10</td>
<td>978</td>
<td>18.07</td>
<td>10</td>
<td>.99</td>
<td>.88</td>
<td>.013 (.005 – .018)</td>
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<tr>
<td>Resident communication items on latent variable</td>
<td>1073.84</td>
<td>980</td>
<td>5.74</td>
<td>2</td>
<td>.98</td>
<td>.88</td>
<td>.013 (.006 – .018)</td>
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<td>Staff communication items on latent variable</td>
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<td>9</td>
<td>.98</td>
<td>.88</td>
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<td>995</td>
<td>5.45</td>
<td>6</td>
<td>.98</td>
<td>.88</td>
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<td>Resident autonomy items (significant)</td>
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<td>ICA 02</td>
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<td>8.73**</td>
<td>1</td>
<td>.98</td>
<td>.88</td>
<td>.014 (.008 – .019)</td>
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</table>

**Notes:** AGFI = adjusted goodness-of-fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation; RMSEA CL90 = 90% confidence intervals for RMSEA values.

*p < .05. **p < .01.
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References


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