

Supplementary file 1:

Cross-cultural translation and adaption of the ‘Quality improvement While Adopting Quality register outcomes survey’ and validation of the questionnaire indexes

Cross-cultural translation and adaption

The ‘Quality improvement While Adopting Quality register outcomes survey’ [1] was translated from the original Swedish version to Danish using a widely recognized six-step methodology for cross-cultural translation and adaption of self-report measures [2]:

Step 1. Forward-translation into Danish: Two native-speaking Danish translators independently translated the questionnaire from Swedish to Danish. The first translator was a cardiac rehabilitation specialist nurse with experience of using and managing a clinical quality registry. The second translator (who was also the project manager) was experienced with questionnaire studies and methods, as well as quality improvement work, but had no clinical experience. Besides translating, the two translators made additional comments, highlighted challenging phrases, and marked uncertainties, each producing a written report.

Step 2. Synthesis of the Danish translations: The two translators met to discuss and solve discrepancies, and to create a consensus version. All discussions and decisions were documented in a report, written by the second translator.

Step 3: Back-translation into Swedish: Independently, and blinded to the original Swedish version, two translators back-translated the consensus version of the questionnaire from Danish to Swedish. Both translators were fluent Swedish speakers with extensive knowledge of the Swedish and Danish healthcare systems, but with no particular experience with clinical quality registries. One of them had a clinical background. Like the forward-translators, they translated the questionnaire as well as making additional comments, highlighting challenging phrases, and marking uncertainties.

Step 4: Expert committee review: An expert committee, including all the translators and the two developers of the original Swedish version of the questionnaire, reached consensus on a pre-final version based on all translators’ reports. The group strived to achieve equivalence between the source and target version with regards to semantic, idiomatic, experiential, and conceptual equivalence, and both in items, response options and instructions.

Two examples:

There are no ‘Regionalt registercentrum’ (Regional Competence centres) in Denmark, but there are in Sweden (included in item 20-24 and item 27). This response-alternative therefore was translated into the nearest equivalent national centre in Denmark: ‘Regionernes Kliniske KvalitetsudviklingsProgram (RKKP)’ (The Danish Clinical Registries).

In Sweden, the word ‘register’ (registry) is a frequently used and accepted word for clinical quality registries. In Denmark, the word ‘database’ (database) is more commonly used whereas ‘registry’ is rarely used in daily clinical practice. Therefore, the committee reached consensus on using ‘database’ in the Danish version consistently throughout the questionnaire (multiple occurrences).

Step 5: Test of the pre-final version: The pre-final Danish version was field tested for acceptability, clarity and cultural applicability through cognitive interviews [2] among users of five different Danish clinical quality registries. These informants had different professional backgrounds (different clinical backgrounds and different positions in their departments, representing both frontline staff, middle level managers and head of departments) as well as different roles and years of experience with their respective registry (n=15), thus reflecting the target group of the present study. The informants were asked to fill out the questionnaire, and both think-aloud and verbal probing techniques were applied [3]. Comments were recorded in a report.

Finally, a few remaining issues were solved in the expert-committee.

Two examples:

Informants were unsure of what kind of support 'the healthcare region' could offer, and the majority did not know what 'The Danish Clinical Registries' was. As these response options nonetheless represent real support opportunity channels, and are near equivalents to the original Swedish options, they were kept in the questionnaire.

Many of the informants expressed a need for an 'I do not know' and/or 'Not applicable' response option for several of the items. For instance, if the informants had never retrieved data from the database, but was asked to state if they agreed on this being easy (item 29), they could not check a response option they found satisfactory. Instead, they skipped the item, or, alternatively, checked the "neither agree nor disagree" (neutral) response option on the 5-point Likert scale. The developers agreed that this sometimes would be an issue among Swedish registry users as well, but to keep the Danish version equivalent to the original Swedish version, no "I do not know" or 'Not applicable' response option was added.

Step 6. Submission of reports to the developers: Although the original developers had been part of the translation process, the written reports and translations were sent to them for their records. The developers approved the translated version.

Internal consistency of indexes

Cronbach's alpha was used to evaluate the internal consistency reliability of the six indexes in the 'Quality improvement While Adopting Quality register outcomes survey' using survey data from the responders. Cronbach's alpha coefficients of 0.7 or higher were interpreted as acceptable [4].

Five of the six indexes showed acceptable internal consistency with Chronbach's Alpha coefficients between 0.74 and 0.92. The index 'Support from outer setting' had a slightly lower Chronbach's alpha (0.67) than the other indexes, and some difficulties responding to these items was indicated. We therefore decided to discard the use of the original version of the 'Support' index, and instead created a new, dichotomized 'Support' index: First, we created an index of all support sources (own department, support functions at hospital, healthcare region, the Danish Clinical Registries, or the DHRD database). As the kind of support received from these sources was not clear, and as we based on our knowledge of the field knew that one source could, in theory, supply all the necessary help, the second step was to dichotomize the 'Support' index. If the respondent had marked 'agree' or 'strongly agree' to receive the support he/she asked for from at least one of the five sources, it was rated as 'agree', if not, they did 'not agree' to receive support.

Index	Chronbach´s Alpha value
Unit´s use of registry data	0.9208
Data quality and usefulness	0.7995
Support from outer setting	0.6723
Resources	0.7464
Management request for registry data	0.9000
Management involvement in registry-based quality improvement	0.8785

References:

1. Eldh AC, Wallin L, Fredriksson M, Vengberg S, Winblad U, Halford C, et al. Factors facilitating a national quality registry to aid clinical quality improvement: findings of a national survey. *BMJ Open*. 2016;6:e011562. doi:10.1136/bmjopen-2016-011562.
 2. Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976)*. 2000;25:3186–91. <http://www.ncbi.nlm.nih.gov/pubmed/11124735>. Accessed 25 Jul 2017.
 3. Willis GB (Gordon B. Cognitive interviewing : a tool for improving questionnaire design. Sage Publications; 2005.
 4. Terwee CB, Bot SDM, de Boer MR, van der Windt DAWM, Knol DL, Dekker J, et al. Quality criteria were proposed for measurement properties of health status questionnaires. *J Clin Epidemiol*. 2007;60:34–42. doi:10.1016/j.jclinepi.2006.03.012.
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