Research article:

Development, feasibility and performance of a health risk appraisal questionnaire for older persons

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Six tables, No figure.

Additional available material: Health Risk Appraisal Questionnaire (non-printable PDF document, 34 pages)
Abstract

Background: Health risk appraisal is a promising method for health promotion and prevention in older persons. Based on an original American version, we developed a multidimensional, evidence-based Health Risk Appraisal for Older Persons (HRA-O) instrument including a questionnaire and algorithms for producing personalised feedback reports to older persons and health providers. We evaluated the feasibility and performance of the new self-administered HRA-O questionnaire.

Methods: Development of the HRA-O questionnaire based on literature review, focus group, and extensive field testing. Self-reported data on non-disabled community-dwelling older persons in London (UK), Hamburg (Germany), and Solothurn (Switzerland) from base-line of the PRO-AGE study.

Results: Over eighty percent of invited older persons returned the self-administered HRA-O questionnaire. Fair or poor self-perceived health status and high participant age were correlated with higher rates of non-return of the questionnaire. Older participants and those with low educational level reported greater difficulty in answering the HRA-O questionnaire as compared to younger and better educated persons, but even among participants reporting greater levels of difficulty in responding, over 80 percent evaluated the questionnaire as easy. Prevalence rates of identified risks or problems were between 4% and 91% for the 19 domains covered in the HRA-O. Participants’ readiness to change, and self-reported reasons for not changing health behaviour indicated that for most risk factors participants were in a pre-contemplation phase, having no short- or medium-term plans for changing health behaviour, and perceived their health behaviour or preventative care uptake as optimal, despite indications of deficits according to the HRA-O based evaluation.

Conclusions: The HRA-O questionnaire was highly accepted in a broad range of community-dwelling non-disabled persons. It identified a high number of risks and problems, and provided information on participants’ readiness to change health behaviour.
Background

There is a growing interest in health risk appraisal (HRA) for use in older persons. Controlled studies support that HRA combined with personal reinforcement – originally mainly used by large companies in working-age adults - is a potentially cost-effective method of health promotion and prevention for older persons [1]. Providers, organisations, or researchers interested in a HRA can now choose among multiple health risk appraisal (HRA) instruments that have been developed for use in older persons [1].

Among available instruments, the HRA-E (HRA for the Elderly) questionnaire which was developed by a University of California faculty group from 1992 to 1997, has several distinguishing features [2]. However, there are two factors limiting its current potential for use in practice in Europe: First it has been developed and tested in a North American environment as an English and Spanish language version, and there is uncertainty about its feasibility and practicability in other regions or languages. Second, it was last updated in 1997. We therefore developed an updated version of the HRA-E for international use, and named this updated version Health Risk Appraisal for Older Persons (HRA-O).

The purpose of this paper is to present the development and to evaluate the feasibility and performance of the HRA-O questionnaire based on data from an international study (the PRO-AGE study) [3]. (1) To evaluate its feasibility, we analysed response rates and feedback from older persons, and explored participant feedback further among subgroups of older persons in whom use of a self-administered questionnaire is often questioned: among those with a low level of education and among very old persons. (2) To evaluate the performance of HRA-O, we determined prevalence rates of identified risks, problems, and participants’ readiness to change health behaviour as well as self-perceived barriers to change.
Methods

Development of the HRA-O questionnaire

Scientific update of the original HRA-E questionnaire

The initial scientific update of the HRA-E questionnaire consisted of two steps. First, the selection of domains to be included in the questionnaire was re-evaluated. For each domain included in the original HRA-E (e.g., nutrition, physical activity) and potential new domain (e.g., pain, oral health), an international Expert focus group (Denmark, Germany, Netherlands, Switzerland, UK, USA) in the fields of epidemiology, geriatrics, sociology, nursing evaluated the following criteria: (1) magnitude of effect and potential impact on functional impairment; (2) validity and generalisability of results; (3) potential for risk reduction; and (4) feasibility of assessment. As a basis for this expert meeting, we conducted a systematic literature review on risk factors for functional status decline in older persons [4]. The product of this expert group meeting was a list of domains to be included in the updated questionnaire.

In a second step, the same group of experts evaluated the selection of instruments. For each domain, a list of instruments to be considered was generated, in conjunction with information from the current literature informing the experts about the validity and reliability of the instruments for use in community-dwelling older people. The experts used the following criteria for selecting the instruments: (1) reliability; (2) validity; (3) feasibility; and (4) use of the instrument in other large databases of older persons. The product of this meeting was a selection of instruments for inclusion in the updated questionnaire.

Development and pilot testing of first version of HRA-O in the US

Based on the procedure described above, the first version of HRA-O was generated. Instruments for existing domains were adapted, but due to budgetary constraints (high costs for software program changes), the addition of new domains was planned for a later step in the update. The update involved a new version of the HRA-E questionnaire in American English, a consecutive change of the questionnaire data entry system, and an adaptation of the content and logic of the software system generating the feed-back reports to older persons and providers. Furthermore, the software was redesigned to accommodate multiple language versions.

The resulting first version of HRA-O was alpha tested by generating hypothetical cases, and evaluating the functionality and content of data entry, and report generation. Improvements were implemented, and a subsequent beta test in 26 persons in the US
evaluated the use of the system taking into account feedback from older persons and providers (documented with internal report). As a result, there were multiple improvements to the data entry and feedback generation components. In addition, to emphasise the educational nature of the HRA-O, more general health information was added to the participant reports, including behaviour change tips in multiple areas while still providing personalised health status assessment and individualised feedback based on readiness-to-change.

**Development and pilot testing of first version of HRA-O questionnaire**

In a next step, the questionnaire were translated into the German language by a professional translator, and then translated back to the English language by a second translator who was blinded for the original version. The back-translation was compared with the original version, and discrepancies were resolved by a third independent translator. Subsequently, based on this version intended for use in Germany, we developed a version for use in Switzerland. Language and grammar were adapted, and a German version for use in Switzerland was developed. As a next step, for these two language versions (Germany German, Switzerland German), the questions were regionally adapted by focus groups of professionals and older people. For example, examples of food items or examples of types of physical activities were adapted to the regional situation. After alpha testing and subsequent beta testing in 10 persons in Switzerland, a pilot study was conducted with a prototype version of the questionnaire in 150 persons in Hamburg (Germany), Ulm (Germany) and Bern (Switzerland) [5]. This study revealed both a high acceptance rate among older persons, as well as high prevalence rates of problems and risks identified with the first version of HRA-O. Based on the evaluation of the results of this pilot study (e.g. participant feedback to questionnaire, items in questionnaires with high proportion of missing answers), questionnaire sections requiring improvement were identified.

**Validation of the first version of the HRA-O questionnaire**

Despite the fact that the HRA-O contained validated instruments for evaluating risks in the selected domains, for many instruments there was only limited information on test-retest reliability, and for the reliability of a self-administered version as compared to an interviewer administered version. For this reason, these two factors were evaluated in subsamples of the pilot study that tested the first version of the HRA-O [6,7].

In a first sub-sample of the pilot study in Hamburg, Ulm, and Bern, the test-retest reliability of the instruments of this first version of HRA-O was evaluated. In a sample of 100 community-dwelling older persons, test-retest reliability of instruments was good to excellent,
as measured with Cohen’s Kappa (0.64≤κ≤0.89) [6], with the following exceptions. For three domains (pain, preventive care, and falls) Cohen’s Kappa was <0.6.

In a second sub-sample of 50 persons in Hamburg and Bern, the validity of the instruments included in the prototype version was determined by comparing self-administered with interviewer-administered answers to the questionnaire [7]. Cohen’s Kappa revealed good to excellent validity with values ranging between 0.69 and 1.0. Values were below 0.69 for instruments on physical activity, oral health, and basic activities of daily living.

Low Kappa values found in these validation studies could be explained by suboptimal presentation of the questions in the self-administered questionnaire, and as a result, introductory statements, wording of these questions, and graphical presentation of items were improved.

**Development and pilot testing of the HRA-O version 2**

Based on these findings, additional focus group meetings, and pilot tests in small groups of older persons in Switzerland, Germany, and the UK, an updated American English version of the HRA-O questionnaire and of the content of the feedback statement was developed. At this stage, the feedback statements were translated to the German language, back translated to the English language, and discrepancies were resolved with a third translator. Subsequently, based on the American English version, a separate British version for use in the UK was developed, based on changes in language, grammar, and style. Similarly, based on the German version for use in Germany, a separate version for use in Switzerland was generated by adapting language, grammar, and style.

As a next step, based on these four language versions (American English, UK English, Germany German, Switzerland German) for each project region, the feedback statements were regionally adapted by focus groups of professionals and older people. For example, addresses, referrals to health providers, eligibility or information on payment for preventive care services or information on how to get preventive care were adapted to the regional situation. We then tested the feasibility and validation of this updated version in three samples of older people (UK: urban-based general practitioner lists, N=348; Germany: occupants of sheltered housing facilities, N=149; Switzerland: community-based lists in rural/suburban area, N=213) [8]. This study confirmed feasibility of the HRA-O questionnaire [8]. For example, the majority of people judged the questionnaire as easy to comprehend (UK, 81.4%; Switzerland 97.2%; Germany 93.1%) and to complete (83.2%, 95.8%, 91.4%). In the British sample, feedback of older persons to the participant reports was systematically evaluated [9]. Of those who completed the questionnaire and received tailored written health promotion
advice, 39% provided feedback on this with comments that were used for increasing the acceptability of the tailored advice.

Validation of the HRA-O version 2

One of the changes of HRA-O version 2 was the improved presentation and wording of questions related to preventive care use. However, given the uncertainty of self-reported information on preventive care use, we decided to further validate it. For this purpose, in a sample of 213 community dwelling older persons in Switzerland, a validation study was performed to compare self-reported data of preventive care use with medical record based information obtained from general practitioners. Agreement of self-reported information with medical-record based information was good to excellent with agreement over eighty percent for all measures of preventive care [10].

Development of the third and final version of HRA-O

Based on the studies and testing described above, a third and final revision of HRA-O was produced. Based on an updated literature review, the selection of domains and instruments for the final HRA-O was re-evaluated. At this stage, budget was available to add new domains, and several questionnaires evaluating additional domains were added to the questionnaire. The GOHAI (Geriatric Oral Health Assessment Index) was added to assess the impact of oral conditions on physical and psychosocial functions [11]. For pain, the multidimensional Geriatric Pain Measure was selected to evaluate the experience and intensity of pain, the impact of pain on function and on social network [12]. We also added a measure of preclinical functional decline to identify people early in the trajectory of functional status decline [13]. We also added questions on falls, including items on fear of falling and falls risk [14]. Finally, we added questions on inappropriate medications, and selected from those developed by consensus criteria the drugs judged as most important and with the highest prevalence of use [15].

Field testing of the third and final version of the HRA-O in the United States

In order to test the revisions made to the final HRA-O, a pilot study was conducted in conjunction with the Center for Healthy Aging in Santa Monica, CA (documented with internal report). Overall, 84 community-dwelling older persons who had participated in an earlier pilot study of the original HRA-E participated in this field testing, completed the new HRA-O questionnaires, received feed-back reports, and were asked to provide feed-back on the new HRA-O. Results confirmed feasibility and a high prevalence rate of identified problems and risks, and only minimal remaining areas of improvement were found at this
stage. Furthermore persons who recalled the earlier HRA-E field test, confirmed that updates had resulted in improvement related to ease of administration and completeness of contents.

Description of the final HRA-O

The third and final version of the HRA-O was produced in an American English, British English, Germany German, and Switzerland German version. The British English version of the questionnaire is given in the Appendix. The 19 domains included in this final HRA-O questionnaire are listed in Table 1 [2, 11-35].

Generation of feed-back reports to older participants and health care providers is based on a computerised system. Answers of completed questionnaires are entered in a database, and an updated software system generates feedback reports by selecting and arranging words and sentences from more than 1000 possible feedback algorithms. Feed-back reports were developed based on current scientific evidence related to health promotion, risk factor modification, and problem management. The feed-back report to the health care provider is arranged in the format of a check-list on one double sided page. The feed-back report to the older participant is personalised and contains both general information as well as individualised specific recommendations derived from the questionnaire analysis. Cross-links were made between domains, for example by taking into account level of physical activity and body mass index when giving recommendations to an older person reporting high blood pressure management. Participants’ readiness to change health behaviour or self reported reasons for not changing behaviour was taken into account. In addition, feed-back reports to older participants also included sources of additional information.

Study participants

The present analyses are based on the use of the third and final version of the HRA-O questionnaire in the PRO-AGE study [3]. The PRO-AGE study examines the effects of the HRA-O linked with a site-specific reinforcement on self reported health behaviour and use of preventative care in non-disabled community dwelling older persons. All methodological aspects related to the recruitment process, the study protocol, and base-line characteristics of the study population have been described elsewhere [3]. Data used in this study are from the intervention groups of the three sites of the randomised controlled study (London, UK, Hamburg, Germany, Solothurn, Switzerland).

Data collection

Prior to randomisation, all study participants had completed a self-administered Pra (Probability of risk of hospital admission) questionnaire [36], providing information on base-
line characteristics of study participants. After randomisation, all subjects allocated to the intervention group were sent a HRA-O questionnaire. Due to budgetary constraints, no reminders were sent to older persons who had not returned the HRA-O questionnaire. The HRA-O questionnaire contained all items listed in Table 1, and at the end a brief survey on participant feedback back to the questionnaire.

**Statistical analyses**

Analyses were conducted according to an a priori analytic plan. Base-line characteristics of persons returning the HRA-O questionnaire (“responders”) were compared with those of non-responding persons (“non-responders”). P-values for differences in base-line characteristics were derived from multivariable logistic regression analyses with a covariate pool consisting of the individual base-line items. P-values for differences in the Pra score between responders and non-responders were derived from t-tests.

Feed-back to the HRA-O questionnaire was compared between participants with higher and lower educational level, and between participants older and younger than 75 years. Categorical and binary outcome data are analysed using chi-square tests; continuous outcome data are compared using t-tests if normally distributed, Mann-Whitney U test if skewed. Data were analysed using the SAS program [37].
Results

Response to HRA-O questionnaire from PRO-AGE study

The numbers (percentage) of persons returning the HRA-O questionnaire in the intervention group were 1090 (87.9%) in London, 804 (91.6%) in Hamburg, and 748 (85.6%) in Solothurn. Table 2 compares the characteristics of persons returning the HRA-O questionnaire with those of non-responding persons. At all sites, persons with fair or poor self-perceived health status were less likely to return the HRA-O questionnaire as compared persons with good or very good self-perceived health status. In Solothurn, this difference was small and statistically non-significant; in London and Hamburg, this difference was larger and statistically significant. In Hamburg, participant age was also related to HRA-O questionnaire response with older participants having a lower return rate as compared to younger participants. No other characteristics affecting response were identified among the three sites. Overall Pra risk status was similar between responders and non-responders.

Feed-back to questionnaire

Acceptance of the HRA-O questionnaire was high, with more than 85% of persons rating comprehension and completion of the questionnaire as easy or very easy. Tables 3 and 4 list the participants’ feed-back to the HRA-O questionnaire according to participants’ age and educational level at the three study sites. As shown in Table 3, a significantly higher proportion of over 75-year old persons had difficulties with the questionnaire, as compared to younger persons. Similarly, persons with a low level of education had more difficulties with comprehending or answering the questionnaire as compared to persons with a higher level of education. However, even among subgroups reporting greater difficulty in using the questionnaire, the proportion of older persons rating the questionnaire as difficult was less than 20%.

The proportion of persons using assistance for completing the questionnaire ranged from 5 to 31% percent according to subgroup and study site. Self-reported time needed for completing the questionnaires varied between study sites and participant age. Persons in Solothurn needed more time to complete the questionnaire as compared to persons in London and Hamburg. Over 75-year-old persons needed significantly more time to complete the questionnaire as compared to younger persons in all sites. Although about one third to one half of study participants felt the questionnaire was too long, there was a notable minority of participants suggesting that additional domains should be added to the questionnaire.
Prevalence of identified risks and problems

Table 5 lists the prevalence of problems and risks identified among study participants at the three study sites. Prevalence rates of identified risks or problems were between 2 and 91% for the 19 domains covered in the HRA-O. Despite the fact that there were notable differences in prevalence rates between sites (e.g., consumption of high fat food, preventive care use, marginal family ties), there were many similarities between sites (e.g., alcohol use, falls, functional status, vision and hearing problems, physical activity).

Self-reported reasons for suboptimal health behaviour and preventive care use

Table 6 lists participants’ readiness to change health behaviour and self-reported reasons for suboptimal health behaviour use or preventive services. With regard to physical activity and nutrition, only a small minority of 5.4 percent or less of participants declare that they plan to change food intake or level of physical activity in the near future. With regard to tobacco use, this was different. One third to one half of persons using tobacco report that they plan to quit within the next month or the next 6 months. Self-reported reasons for not changing nutrition or level physical activity are consistent with these findings. The most frequently reported reason for not changing is the self-perception of optimal health behaviour in the presence of suboptimal health behaviour. For example, In London, among 933 persons with low level of physical activity, 338 (36.2%) reported that they did not increase their level of physical activity because they thought they already exercised frequently and regularly.

The self-reported reasons for not using all preventive care services recommended to older persons varied by site. In London, more than 50% of the participants stated that their general practitioner never had recommended it. In Solothurn and Hamburg, the most frequently given reason was “I have already had these preventive services.” Other reasons, such as cost or lack of time were given by less than 5 percent of participants at all sites.
Discussion

To our knowledge this is the first HRA-O instrument that has been developed outside North America for international use. This HRA-O approach has several distinguishing features: (1) Its main purpose is a multidimensional evaluation to identify and modify the multiple risk factors of functional decline; in contrast to many other HRA instruments including only selected health behaviour and preventive care issues or focussing on risk factors for mortality; (2) the central component of the HRA-O is a self-administered questionnaire based on scientific evidence for selecting domains and validated instruments; (3) the HRA-O includes a computerised algorithms generating feed-back to both providers and older persons including evidence-based recommendations for promoting health and addressing identified risks or problems; (4) it uses readiness and barriers to change to enhance tailoring of participant feed-back; (5) it contains a common core with regional modules, and can be used in multiple languages.

Base-line data from its use in the PRO-AGE multi-centre trial confirm that the HRA-O questionnaire is feasible, also among persons older than 75 years and among those with lower educational levels. In addition, the HRA-O questionnaire identifies a large number of potentially modifiable risks and problems. Participants’ readiness to change, and self-reported reasons for not changing health behaviour indicated that for most risk factors participants were in a pre-contemplation phase, having no short- or medium-term plans for changing health behaviour, and perceived their health behaviour or preventative care uptake as optimal, despite indications of deficits according to the HRA-O based evaluation.

There are some limitations. This study might overestimate response rate to the HRA-O questionnaire because only those participants who had given informed consent to participate in the study were sent the HRA-O questionnaire. This limitation cannot be avoided in the context of a controlled trial. Despite this limitation, the response rate of >80% for a multidimensional questionnaire, without reminder system, is remarkable and underlines its feasibility. One likely explanation of the high response rate was the contribution of the general practitioner’s relationship with his/her patients.

Second, we cannot exclude that feasibility might differ in regions with other languages, cultures, or health care systems. Although feasibility of the instrument would certainly differ in populations with a very low level of education (in this project, most lower educated persons had at least 9 years of basic school education), it is likely that the instrument is feasible at other sites as well. The three study sites represented in this study include urban and rural regions, different languages, different health care systems, and persons with a broad range of socio-economic characteristics.
Third, the prevalence rates found in this study are not representative for the population of community-dwelling older persons in these regions. Participants were selected according to practice registration and eligibility criteria, and persons not interested in participating in the study were excluded. However, it is not the purpose of this analysis to report representative epidemiological data, but to report performance data of an instrument in a broad range of community-dwelling older persons.

The study has implications for practice and research. At the present time, many intervention programs addressing health promotion and prevention have used alternative strategies requiring a large amount of professional time without a self-administered component. For example, most programs of preventive home visits start with an approximately two-hour multidimensional evaluation of older persons by a health professional [38]. Other programs use a self-administered survey approach, but are limited to a brief questionnaire focusing on general aspects of health risks and do not address all potential risk domains with domain-specific screening instruments [1].

There is potential for further development. With additional data it might be possible, in the future, to give an individual quantitative estimate of the risk for functional status decline, and the potential impact of risk factor modification. The HRA-O instrument combined with specific interventions might be a promising tool for developing individualized health promotion and prevention programs in older persons.
Competing interests

None declared.

Authors’ contributions

All authors are members of the PRO-AGE project group and participated in the conceptualization and implementation of the study. HM and UD were the administrative coordinators of PRO-AGE project, AS was the technical/ scientific coordinator of the project. AS, JB, CS, and HM developed the study plan. KK, DH, SI, CS implemented the London (UK) trial; UD, JA, WR, HM implemented the Hamburg (Germany) trial; AS was responsible for the implementation of the study in Solothurn (Switzerland). GG, ME, KI, and AS performed the central data management and data analysis. JH was responsible for HRA-O development in the United States. JB was involved as senior consultant to the project, and contributed to the trial design, data analysis, and data interpretation. AS and KK developed the first version of this manuscript. All authors contributed to the present manuscript.

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Solothurn (Switzerland) and PRO-AGE scientific project coordination: Christoph Minder contributed to the original proposal and analytic plan, Stephan Born was responsible for data management, Thomas Münzer and Stefan Goetz contributed to the development and implementation of the intervention programme in Solothurn.

Ethical approval

The ethical approval of the PRO-AGE project was from the Brent Medical Ethics Committee and King's College Hospital Research Ethics Committee (London), the Ethics Committee of the Ärztekammer Hamburg (Hamburg) and the Kantonale Ethikkommission Solothurn (EKO 0023) (Solothurn).

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19. Human Population Laboratory. Health and Ways of Living, Human Population Laboratory (HPL) 1965 Men's Form


Additional available material

Health Risk Appraisal Questionnaire: Older Persons Health Profile Questionnaire, version 2000, British English version UK (non-printable PDF document, 34 pages)
Additional files provided with this submission:

Additional file 2: bmc-quest.pdf: 335Kb
http://www.biomedcentral.com/imedia/1138044906116330/sup2.PDF

Additional file 1: bmc-tabl_quest.pdf: 215Kb
http://www.biomedcentral.com/imedia/7106720751163308/sup1.PDF