Multidimensional Geriatric Assessment: Back to the Future

Second and Third Generation Assessment Instruments: The Birth of Standardization in Geriatric Care

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The systematic adoption of “second-generation” comprehensive geriatric assessment instruments, initiated with the Minimum Data Set (MDS) implementation in U.S. nursing homes, and continued with the uptake of related MDS instruments internationally, has contributed to the creation of large patient-level data sets. In the present special article, we illustrate the potential of analyses using the MDS data to: (a) identify novel prognostic factors; (b) explore outcomes of interventions in relatively unselected clinical populations; (c) monitor quality of care; and (d) conduct comparisons of case mix, outcomes, and quality of care. To illustrate these applications, we use a sample of elderly patients admitted to home care in 11 European Home Health Agencies that participated in the AgeD in Home Care (AD-HOC) project, sponsored by the European Union. The participants were assessed by trained staff using the MDS for Home Care, 2.0 version. We argue that the harmonization by InterRAI of the MDS forms for different health settings, referred to as “the third generation of assessment,” has produced the first scientific, standardized methodology in the approach to effective geriatric care.

Key Words: Comprehensive geriatric assessment—Minimum data set—Scales—Older adults—Nursing homes—Resident assessment instrument—Home care.

Health care systems are increasingly confronted with older patients characterized by several concomitant, overlapping clinical conditions, receiving multiple, frequently interacting medications and treatments. Many of these patients may have limited financial resources and social and family support inadequate to meet their increasing care needs. The complexity of these patients translates into various degrees of functional and cognitive impairments, which increases their risk of developing geriatric syndromes such as delirium, falls, and incontinence and ultimately affects quality of life (1).

This degree of patient and care complexity surpasses the traditional understanding of medicine and its role. Even though health care systems have evolved to incorporate new technologies and clinical knowledge enabling them to deliver increasingly sophisticated acute care, these systems are constantly challenged by complex geriatric patients with chronic and uncertain clinical status and their shifting medical, psychological, and social needs.

Our objective here is to illustrate the utility of Minimum Data Set (MDS) assessments—as extensions of comprehensive geriatric assessment (CGA)—in several clinically relevant areas. In turn, we show how MDS-derived data sets have been used in (a) clinical prediction, (b) studies of intervention outcomes, (c) quality improvement, and (d) international comparative research.

BACKGROUND

CGA

Recognizing the limitations of the traditional medical approach nearly three decades ago, geriatricians began to espouse a new “technology”: CGA (2). An extensive literature has documented that applications of CGA have resulted in more detailed evaluation, improved care planning, and overall better quality of care (3–5). However, even though there is a common understanding that CGA is appropriate for assessment of frail elderly patients, geriatric assessment and management programs vary in terms of structural components and care process (3). In its original implementations, CGA used collections of single-domain measures, the “first generation” of assessment instruments (4). In fact, even though the component scales were validated, different geriatric programs frequently used different scales and/or measures in some of the domains.

MDS

In 1987, major reforms of U.S. standards for nursing home care were signed into law (OBRA’87). Among other things, resulting regulations required that residents of nursing facilities be assessed in 18 problematic areas. A consortium of scientists was contracted by the federal government to develop a novel assessment instrument. The MDS—Resident Assessment Instrument (MDS-RAI, now known as the MDS-NH)—became the first health setting-specific comprehensive assessment instrument (6). In this respect, the MDS-RAI had become the prototype “second generation” assessment instrument because of its omni-comprehensive nature, the attention to its reliability and validity testing, and development for a specific health care setting. The MDS established a new philosophy and approach in the field of systematic geriatric care, laying a groundwork for evidence-based geriatric assessment and management (7,8).
The major MDS instruments contain over 350 data elements including sociodemographic variables; numerous items characterizing physical, cognitive, and emotional status; as well as all clinical diagnoses. It also includes information about an extensive array of signs, symptoms, syndromes, and treatments being provided. Within the instruments are embedded several scales exploring some of the most common problematic domains in elderly persons (9,10). Use of the MDS-NH has been mandatory since the early 1990s for all U.S. nursing home residents.

InterRAI, a scientific not-for-profit corporation, has elaborated additional “second generation” setting-specific instruments (i.e., home care, postacute care) and has recently released a suite of eight instruments, totally revised, validated, and standardized (www.interrai.org). These instruments are built on a common set of assessment items that are considered to be important in all care settings. The instruments in fact share a substantial amount of information (core elements) and are intended for older patients taken care of in all health care settings and to improve the transfer of information in transitional care. The common items have identical definitions, observation time frames, and scoring. The instruments included in the suite are considered the “third generation” of assessment instruments. In particular, there are instruments that address the following populations: frail elderly in the community, home care, assisted living, nursing homes, postacute care, palliative care, acute care, and mental health. The InterRAI LTCF (nursing home), the InterRAI HC (home care), and the InterRAI MH (mental health) are used in all Canadian provinces except Quebec; the InterRAI LTCF is used in all nursing home in Iceland and Finland, whereas the InterRAI HC has been adopted in Switzerland. InterRAI instruments are now starting to be used in Norway, the U.K., France, Italy, Japan, Australia, and China (11).

Large, Clinically Relevant Data Sets

The systematic adoption of these instruments for clinical, administrative, and/or research purposes has contributed to the collection of massive amounts of information and to the creation of large data sets. The data sets have become an important resource for filling knowledge gaps in these understudied populations. Older adults with multiple chronic conditions are still systematically excluded from clinical trials that inform the evidence base for medicine. Nowadays, these clinically relevant data sets are commonly used to conduct observational studies which, when appropriately performed, have proved as valid and useful as randomized clinical studies (12–14).

Research databases can be derived from data sets assembled via the systematic collection of data with InterRAI instruments. An example is the Systematic Assessment of Geriatric drug use via Epidemiology (SAGE) data set containing data on residents of 1492 nursing homes in five U.S. states—Kansas, Maine, Mississippi, New York, and South Dakota—assessed with MDS-NH instruments (12). The SAGE database contains data from the MDS-NH assessment and information on medications, as well as data from other cross-linked, publicly available databases. The SAGE database has enabled exploration of a breadth of clinical questions regarding syndromes such as falls; pain; and prevalent medical conditions such as hypertension, dementia, cardiovascular conditions, and diabetes. A major study using the SAGE database (15) reported that the management of cancer pain in elderly patients is overly inadequate, with 26% of individuals with daily pain receiving no analgesic therapy. Specific predictors of inadequate pain management were identified to include age, minority race, and low cognitive performance. Results based on analyses of the SAGE database have provided guidance to develop programs to improve the prescribing of appropriate drugs (i.e., analgesics) and to reduce the use of inappropriate medications.

A second example of a large research data set constructed with information from an MDS tool is the AgeD in Home Care (AdHOC) data set, which was developed for a study conducted in 11 European countries, funded by the European Union Commission. Detailed information about the study and data set are available elsewhere (16). This cross-national, longitudinal database comprises data collected with the InterRAI MDS for Home Care (MDS-HC version 2.0) (17). In a manner similar to the SAGE data set, the MDS-HC data have been cross-linked to: (a) data on all medications used by each patient at any assessment; (b) data on vital status; and (c) data on the home care agencies, including organization, structures, financing, and actual delivery as well as much other contextual information. The AdHOC participant population consisted of a random sample of 4007 elderly patients admitted to receive services provided by home care agencies in urban areas between 2001 and 2003 (Table 1). The urban areas included Prague, Czech Republic (participant \( n = 428 \)); Copenhagen, Denmark (\( n = 466 \)); Helsinki, Finland (\( n = 187 \)); Amiens, France (\( n = 381 \)); Nuremberg and Bayreuth, Germany (\( n = 607 \)); Reykjavik, Iceland (\( n = 405 \)); Milan, Italy (\( n = 412 \)); Rotterdam, The Netherlands (\( n = 198 \)); Oslo, Norway (\( n = 388 \)); Stockholm, Sweden (\( n = 246 \)); and Maidstone and Ashford, U.K. (\( n = 289 \)).

Applications—Examples from AdHOC Study

Studies of Prognostic Factors

Oral health problems and edentulism are common in older adults, being present in more than one fourth of older living in the community. These conditions are responsible for chewing problems that can lead to poor nutritional status and alteration in nutrient intake. In particular, presence of chewing problems is associated with suboptimal intake of various nutrients, including fibers, carotene, calcium, and proteins, and with higher intake of fats and cholesterol. These alterations in dietary intake may cause weight loss and increase the risk of systemic diseases such as cancer and cardiovascular disease. In addition, it has been suggested that low nutrient intake is associated with poor muscle strength and physical performance, leading to disability in basic activities of daily living (ADL).

The AdHOC data set has been used to verify the hypothesis that the presence of chewing problems, as assessed using a single question in the MDS-HC, is associated with a greater risk of mortality, irrespective of potential confounders (18). Of
Table 1. General Characteristics of the AdHOC Study Population

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total Population (N = 4007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female gender</td>
<td>74.1%</td>
</tr>
<tr>
<td>Age, y (mean ± SD)</td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>80.9 ± 7.5</td>
</tr>
<tr>
<td>Women</td>
<td>82.8 ± 7.2</td>
</tr>
<tr>
<td>Total</td>
<td>82.3 ± 7.3</td>
</tr>
<tr>
<td>Number of diseases (mean ± SD)</td>
<td></td>
</tr>
<tr>
<td>ADL scale score (mean ± SD)</td>
<td>2.1 ± 1.5</td>
</tr>
<tr>
<td>IADL scale score (mean ± SD)</td>
<td>1.1 ± 1.7</td>
</tr>
<tr>
<td>CPS scale score (mean ± SD)</td>
<td>4.5 ± 2.1</td>
</tr>
<tr>
<td>Living alone</td>
<td>60.4%</td>
</tr>
</tbody>
</table>

Note: AdHOC = AgeD in HOme Care; SD = standard deviation; ADL = Activities of Daily Living (range 0–7, a higher number indicates higher impairment); IADL = Instrumental Activities of Daily Living (range 0–7, a higher number indicates higher impairment); CPS = Cognitive Performance Scale ranges from 0 (no cognitive impairment) to 6 (severe cognitive impairment).

In the database of the AdHOC study, in fact, are included some home care recipients whose care was coordinated by a case manager, and others whose care was not so coordinated and whose care management might have been in conflict, overlapping across different agencies, providers, and professionals. Overall, 1184 (36%) clients received home care based on case management, and 2108 (64%) received a traditional care approach (no case manager).

Hours of formal home support services (including home help, home care, visiting nurses, and volunteer services) per week did not differ significantly between the two groups (case management group, 24.6 ± 90.6; traditional care group, 25.3 ± 43.4; p = .78). Similarly, weekly hours of rehabilitative interventions, including physical therapy and occupational therapy, were similar in the two groups (case management group, 0.4 ± 2.7; traditional care group, 0.4 ± 1.8, p = .71). With respect to outcomes, 1-year mortality did not differ significantly between the two groups; 190 (16%) participants died in the case management group, and 390 (16%) in the traditional care group. However, only 81 of 1184 individuals (6.8%) in the case management group as opposed to 274 of 2108 (13%) of those in the traditional care group were admitted to a nursing home (p < .001). Even after adjusting for potential confounders, the risk of nursing home admission was significantly lower for participants in the case management group than for those in a traditional home care model (adjusted odds ratio [OR] = 0.56, 95% CI, 0.43–0.63). Figure 2 shows the event-free survival curve according to case manager status.

Home care services based on the use of the MDS-HC instrument and on the full integration of case managers with general practitioners and geriatric evaluation units were hypothesized to result in a higher rate of adoption of preventive strategies. In the case manager group, 1350/1539 participants (88%) compared to 2046/2468 (83%) in the no case manager group had blood pressure monitored during the previous 2 years (p < .001). After adjusting for potential confounders, this result was still statistically significant (OR 1.31, 95% CI, 1.08–1.59). Similarly, more participants in the case manager group received influenza vaccination (1083/1539, 70% vs 1293/2468, 52%, p < .001) and had their medications reviewed (312/1539, 20% vs 356/2468,
15%, p < .001), compared with those in the no case manager group. Both associations held true even after adjusting for confounders (OR: vaccination 2.08, 95% CI, 1.81–2.39; medication review 1.69, 95% CI, 1.42–2.01) (22).

Quality Indicators
In all sectors of the health care system, efforts are underway to improve quality of care, to enhance the cost-effectiveness of service delivery, and to make possible the recognition and adoption of best practices. There is attention to the construction of specific quality indicators that examine the structure, process, and outcomes of care. Standardized, comparable indicators of quality have recently become available for nursing home (23) and home care (24). The use of comprehensive assessment data from the MDS-HC has considerable promise for providing more meaningful information about the quality of care provided by home care agencies. For example, a failure to make all reasonable efforts to treat pain successfully should be considered one of the most important indicators of poor quality. Of the total sample of the AdHOC study, 2380 participants (60%) presented with pain, ranging from 77% in the Czech Republic to 47% in Italy (25). Twenty-four percent of individuals who reported having daily pain received no analgesics, ranging from 13% in the U.K. to 31% in Italy. Furthermore, another 35% received medications without adequate pain control, ranging from 18% in Finland to 58% in Denmark (Figure 3).

International Comparisons
Health care systems in different countries have elected to confront the same demographic changes with an extremely heterogeneous array of schemes and possible solutions. In his introduction to Home Care for Older People in Europe, Raymond Illsley notes that it was impossible to compare systems of different countries and to identify a model of health care organization and delivery that could be considered a reference (29).

The systematic application of the same MDS-HC instrument in the AdHOC study allows comparison of home care case mix and organization across 11 European countries (15). For example, Figure 4 shows the functional and cognitive characteristics of participants in the AdHOC study. The application of the same standard instrument clearly shows that what is called “home care” has different meanings in different countries. Home care clients in northern Europe have a lower level of functional and cognitive impairment than those living in France and Italy. In Italy and France, it is believed that extremely dependent individuals are eligible for home care programs, whereas in Nordic countries, home care services are available to only slightly disabled persons. In Germany and the U.K., home care recipients have a level of impairment that is halfway between that of elders in Italy and the Nordic countries.

Comment
In this special article, we have addressed the utility of analyzing data sets derived from the systematic adoption of
common, comprehensive assessments of older patients. To highlight these potentials, we have used the example of the AdHOC study conducted in 11 European countries among recipients of home care services. Such results would not have been possible without the availability of common, standardized CGA instruments.

After the prototypical experience with the MDS instruments, the international, not-for-profit, InterRAI corporation released a suite of eight instruments for different health care settings, that is, the third generation of assessment instruments. These instruments share a common core of elements (70%) in addition to a limited number of setting-specific items. These instruments use the same philosophy of assessment intended to facilitate clinical communication both between different caregiving professionals and across acute, postacute, and long-term care settings. It is hoped that they can enhance multidisciplinary care planning and continuity of care and provide the essential basis for the most effective use of information technology. The use of these standardized instruments gives an opportunity to doctors, nurses, families, advocates, administrators, and public payers to track changes in an older adult’s status across settings and over time. Each of these instruments has been developed to be rooted in care planning through a triggering system that enables the identification of the person’s problems, but also the provision of quality measures, case-mix systems, and eligibility screeners.

Earlier versions of second generation instruments have been implemented in all U.S. nursing homes. In pre- versus postimplementation comparisons in a multistate demonstration program, an impressive impact on the quality of care being delivered was suggested. Evidence of use of advanced directives increased by 60%, the use of restraints dropped by 40% (particularly among cognitively intact residents), the use of indwelling catheters dropped significantly, while there was a dramatic increase in the use of preventive skin programs (30,31). Also, the rate of functional decline was abated in physical function, cognition, continence, or psychosocial problems; consequently, the prevalence of pressure ulcers, dehydration, and poor nutrition declined (32). Finally, in the postimplementation phase, the hospitalization rate declined by 25% with no increase in mortality (32).

MDS-based data sets represent a resource to examine crucial issues pertinent to the clinical care of very old, complex, chronically ill patients living in different settings, especially in nursing homes and in the community. As these patients are usually not enrolled in clinical trials, physicians and the health personnel must exercise their best judgment in making any decision. Linking reliable and valid outcome measures constructed with the MDS items to the interventions received—pharmacological and non-pharmacological—has opened a new field of outcomes-oriented geriatric research relevant to scientists, clinicians, and administrators (11).

Well-designed outcomes-oriented research can be used to supplement clinical trials information and to determine the effectiveness of specific treatments in these previously underserved populations (11). Outcomes technology can add to our knowledge about the treatments (procedures and criteria) that work better and about what goals should be set in different groups of patients. These data also may be useful for administrators, because they could form the basis for better targeting of potential clients and for internal quality assurance and quality improvement. Moreover, it is possible to link data about specific management protocols of a given condition (i.e., specific medication treatment) to specific outcomes, such as the hospitalization rates for that clinical problem, to make benchmarking possible.

The implementation of the MDS instruments in different health care settings and in different countries has already paved the way to a nationally and internationally representative database that proved a powerful tool for clinical research (33–36), yet, there are also concerns relating to the quality of data and the training of personnel. The instruments, in fact, are frequently perceived by health care personnel as too long and subtracting resources from the daily services’ activities. In this respect, it could be hypothesized that this negative approach impacts on data entry. Furthermore, personnel in long term care are often transitory, making training difficult and
superficial. Finally, the level of clinical details on patient preferences is not systematically investigated; this leaves room for instrument improvement.

**REFERENCES**


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