

# Importance of Optimizing Visual Acuity in Vulnerable Seniors Living in an Institution

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In 2009, 14 per cent of the Canadian population was 65 years-of-age or older, a percentage that will rise to about 24 per cent by 2036.<sup>1</sup> In 2008-2009, more than 155,000 seniors over age 65 in Canada were living in a long-term care institution, with roughly 40,000 of them in Quebec.<sup>2</sup> Over the past few years, there has been a reorganization of health services, with a movement towards the community, including an increase in out-patient services and home care.<sup>3</sup> One impact of these changes is that the seniors admitted to long-term care are increasingly dependent, have more complex illnesses and more motor and sensory disorders.<sup>4</sup> Between 60 per cent and 80 per cent of them have a cognitive

deficiency,<sup>4</sup> which is not surprising given that over 8 per cent of the Canadian population aged 65 and older have Alzheimer's disease or other forms of dementia.<sup>5</sup> This prevalence exceeds 30 per cent in people age 85 or older.<sup>5</sup> The ageing of Canada's population, with the increase in the prevalence of dementia and the complexity of diseases in later life, will challenge the healthcare system and result in the need for adjusting the supply of care and services.

It is preferable for seniors to be able to stay at home as long as possible in order to keep their social network intact, preserve their environmental landmarks and thereby enjoy a better quality-of-life. In spite of that, the complexity of the diseases, the severity of the resulting disabilities, as well as the presence of behavioural problems are factors that will eventually result in them being admitted to a long-term care institution.<sup>6</sup> Institutionalization is often connected

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more with the seriousness of the disabilities resulting from disease than with the disease itself. Certain characteristics connected with the informal caregiver, such as more advanced age, exhaustion or depression, may also lead to earlier institutionalization of the senior receiving care.<sup>6</sup>

In Quebec, roughly 4.7 per cent of the population aged 65 or older is living in a residential and long-term care centre ((CHSLD) Centre d'hébergement et de soins de longue durée). This living environment is reserved for adults losing their functional or psycho-social independence and who require three or more hours of care to assist them in their daily activities. Therefore, they are "vulnerable" individuals who need help and appropriate care to operate on a daily basis. The concept of vulnerability in seniors is constantly changing, but can be defined as "individuals usually older than 75 years of age who, due to a build-up of multiple, chronic diseases, often require one or more support services to handle daily activities".<sup>7</sup> Thus, vulnerability can be considered an increasing age-related fragility.<sup>8</sup> Beyond the previously stated dementia issues, other diseases resulting in severe

## SUMMARY

Visual acuity is an important measurement taken during an eye exam for checking an individual's ability to see properly and to guide the adjusting of ocular refraction. It is a routine test usually done in a few minutes and with no particular difficulty. However, this measurement can be more difficult to do in seniors with cognition or communication disabilities. For example, this may be true for a senior with dementia or suffering from aphasia following a stroke. The purpose of this article is to present certain aspects of population aging, data connected with institutionalization of seniors, various conditions that are more prevalent with age, as well as specific factors demonstrating the importance of optimizing vision in seniors. Lastly, this article will provide an overview of various scales available for measuring visual acuity.

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disabilities can also give rise to the senior being placed in a CHSLD, such as mood disorders, Parkinson's disease, stroke, chronic vascular or lung diseases. The average length of a stay in a CHSLD can be up to three years<sup>9</sup> and often be the senior's last living environment until his/her death. Therefore, it is important to optimize care and quality-of-life by respecting the patient's wishes, expressed by him/her or by the person answering for the patient, since the vast majority of these patients are no longer able to make informed decisions about their health.

A number of diseases affecting seniors can result in communication difficulties and make eye exams and interventions more difficult. This is true, for example, with the severe cognition problems in dementia, stroke-related aphasia, speech slowness/difficulty that sometimes accompanies Parkinson's disease, the apathetic mood of a patient with major depression, the oft-repeated fears of a person with anxiety disorders, deafness, etc. Despite the difficulties, a visual assessment is important because visual impairment is prevalent within the senior population. Globally, 285-million people have a visual impairment and nearly 65 per cent of all those people are age 50 or older.<sup>10</sup> In Canada, the data shows that 278,000 Canadians have a visual impairment, that 108,000 are legally blind and that one-in-three Canadians over age 75 experience a degree of visual impairment.<sup>11</sup> Moreover, the studies show that visual impairment is especially high among people

living in an institution.<sup>12,13</sup> Also, the prevalence of visual impairment and blindness increases with age, regardless of ethnicity,<sup>14-16</sup> primarily because of age-related macular degeneration, glaucoma or cataracts.<sup>14,17</sup> Loss-of-vision can worsen the problems associated with dementia<sup>18</sup> and is an independent factor contributing to behavioural impairments among residents of a long-term care institution.<sup>19</sup> A large part of the visual impairments among these people are due to conditions that can be treated, such as uncorrected refractive errors or cataracts.<sup>12,20</sup> These conditions must be screened for and treated when possible. These findings are even more alarming given that seniors living in an institution do not necessarily receive proper oculo-visual services,<sup>21</sup> and that refraction correction and cataract surgery can considerably improve their quality of life and reduce their depression symptoms.<sup>22-24</sup>

The relevance of performing cataract surgery in seniors living in the community is well documented. The benefits of cataract surgery in seniors living in an institution and without significant cognitive disabilities have also been demonstrated.<sup>24</sup> In spite of that, cataract surgery is not necessarily routinely done on institutionalized seniors. In fact, one study shows that cataract surgery is less well accepted among people living in long-term care. That study reports that seniors with a cognitive deficiency are less able to inform those around them of their vision problems, that their informal caregivers are more skeptical about surgical

procedures, that the benefits of surgery can seem less obvious and that it is more difficult to test their vision.<sup>25</sup> Subjective assessment of visual acuity can present a challenge within an institutionalized population that has major cognition or communication disorders, and clinical judgment must sometimes be used to determine the patient's approximate visual acuity.<sup>26</sup> Even so, a retrospective clinical study showed that it was possible to conduct a full eye examination on seniors living in an institution, regardless of advanced age, cognitive status and communication problems.<sup>17</sup> Also, visual acuity was preserved to an advanced age in eyes not affected by ocular pathology.<sup>17</sup> Therefore, this study suggests that it is possible to assess these seniors, but that the clinical approach must be adjusted in order to maximize the information obtained during the eye exam.

Another issue specifically targeting seniors and where vision can play a major role is falling.<sup>27</sup> In fact, falls are a major health problem given that 30 per cent of seniors aged 65 and older have at least one fall per year,<sup>28</sup> that this percentage reaches 50 per cent in those over 85 living at home<sup>29</sup> and that it is even higher in seniors living in an institution.<sup>30</sup> Also, five per cent of the seniors who fall must be hospitalized.<sup>31</sup> In Quebec, falls that result in an injury represent 10 per cent to 15 per cent of admissions to short-term geriatric units.<sup>32</sup> Falls are multi-factorial in origin.<sup>33</sup> Visual impairment has been cited many times as a risk factor in falling and fractures among seniors.<sup>34</sup> A number of studies, among other

things, have shown that decreased visual acuity presented an independent risk of falling with seniors,<sup>34-36</sup> even though it is not universally accepted.<sup>37,38</sup> Vision assessment in seniors who have had a fall is therefore important and should be systematic,<sup>33</sup> even though this is not currently the case.<sup>39</sup> The studies indicate, among other things, that reduced visual acuity, loss of contrast sensitivity, decreased stereoscopic vision and the loss of visual field can increase seniors' risk of falling.<sup>40-43</sup> Cataract surgery reduces the risks of falls and fractures,<sup>44</sup> as well as injuries.<sup>45</sup> A randomized clinical trial also showed that cataract surgery on the first eye in older women reduced the risks of falls and fractures, as well as anxiety and depression, while improving visual acuity and contrast sensitivity.<sup>46</sup> Cataract surgery on the second eye in that same population was associated with an improvement in visual function as well as a reduced fear of falling and the handicap level.<sup>47</sup> Despite the results in these studies, there is still not enough evidence to show unequivocally that cataract surgery reduces falls among seniors.<sup>48</sup> It is still important, though, to assess the vision of seniors who have fallen or are at risk of falling and to optimize it each time it is possible, either through optical, medical or surgical treatment or through visual rehabilitation.<sup>49</sup>

Visual acuity is the eye's spatial resolution capacity and is clinically measured by identifying the subtended angle in the eye through the smallest recognizable optotype. The standard tool for measuring visual acuity in the general population is still the traditional Snellen chart,

consisting of high-contrast letters or optotypes decreasing in size from top to bottom of the chart.<sup>50</sup> With seniors who have considerable cognition problems that alter the understanding of statements and communication, it is not always possible to measure visual acuity with the Snellen chart. Likewise for other clinical populations and, over the years, new scales for measuring visual acuity have been developed to address specific needs. The logarithmic scale, with a geometric progression in letter height from one line to another,<sup>51</sup> provides a more standardized measure of visual acuity, and its use is favoured in assessing low-vision patients<sup>52</sup> and in epidemiological studies.<sup>53</sup> The Lea symbols chart was designed to measure visual acuity in children aged three to five,<sup>54</sup> and structured in a way that the child can answer either by pointing or naming symbols that are easy to identify at that age.<sup>55</sup> The preferential-looking method was developed to test individuals with an intellectual disability.<sup>56</sup> It is a behavioural technique based on the principal that, in the presence of two targets, the one formed from a network of black and white lines and the other formed from a solid grey bar, a person will prefer to look at the network.<sup>57,58</sup> The individual will continue to prefer the network, during the presentation of successive targets involving a grey bar and a network where the spatial frequency of the black and white lines is increased, provided that he/she is able to make out the lines.

To date, no visual acuity scale has been specifically developed for seniors with severe cognition

impairments or major communication problems. The preferential-looking method (Teller cards), however, appear to have been used with clinical success in a limited groups of seniors in long-term care who have communication problems<sup>59</sup> and moderate cognitive deficiencies.<sup>60</sup> Moreover, as part of a study done in long-term care, researchers demonstrated that visual acuity could be tested in 84 per cent of the residents using Teller cards, versus 74 per cent of participants when the ETDRS (Early Treatment of Diabetic Retinopathy Study) or Lea scale was used.<sup>61</sup> It is important to stress, however, that this study included only people with a slight to moderate cognitive deficiency, since the researchers had immediately excluded residents with a more severe cognitive deficiency.

The studies presented in this paper show that it is important to assess visual function<sup>12,21</sup> and eye health<sup>20</sup> in seniors, especially since eye disease and vision loss show increased prevalence with age. Also, good visual acuity is a factor that plays a critical role in seniors' quality of life<sup>22-24</sup> whereas vision loss can contribute to anxiety,<sup>62</sup> depression,<sup>63</sup> isolation,<sup>62</sup> behavioural disorders<sup>19</sup> and falls.<sup>34,35</sup> These issues are worse among seniors living in an institution,<sup>12,13</sup> because they are more vulnerable due to their tenuous health status and their loss of independence.<sup>6</sup> The cognitive disorders that affect a large percentage of these individuals can reduce their ability to express their needs and their difficulties, where applicable.<sup>25</sup>

Assessing their health, including eye care, is often more difficult, must be adjusted for this population's specific needs, and requires a little more time.<sup>17</sup> These people may also have difficulty communicating and co-operating during an eye exam, which can affect such a simple, yet so important, measurement as visual acuity.<sup>64</sup>

There is no "universal" scale for measuring visual acuity in vulnerable seniors who have difficulty communicating or co-operating. In a clinical context, determining visual acuity often proceeds by presenting the various existing measurement scales one after the other, until one of them sufficiently attracts the patient's attention to enable him/her to co-operate. To date, there is no study to guide the clinician. Therefore, it would be meaningful to know whether there is a better scale than others for adequately measuring visual acuity in vulnerable seniors, or even whether it is possible to optimize the order they are presented in, to speed up the eye exam while minimizing the patient's fatigue level. A study of this sort is currently under way, and the findings will be covered in a later publication.

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## References

1. Statistics Canada, 2010. Population and demography. Canada Year Book 2010. Catalogue no. 11-402-X. p. 315
2. Statistics Canada, 2011. Residential Care Facilities 2008/2009. Catalogue no. 83-237-X. p. 50, p. 55
3. Un milieu de vie de qualité pour les personnes hébergées en CHSLD. Orientations ministérielles. 2003. [http://www.msss.gouv.qc.ca/sujets/groupe/personnes\\_agees.php#milieu](http://www.msss.gouv.qc.ca/sujets/groupe/personnes_agees.php#milieu) Accessed: September 4, 2011.
4. The Canadian Study of Health and Aging Working Group. Canadian Study of Health and Aging: study methods and prevalence of dementia. *Can Med Assoc J.* 1994; 150: 899-913.
5. The Canadian Study of Health and Aging. Canadian Study of Health and Aging: Methods and Prevalence of Dementia (incl. Kergoat M-J). *Can Med Assoc J.* 1994; 150: 899-914.
6. Hébert R, Dubois M-F, Wolfson C et al. Factors associated with long-term institutionalization of older people with dementia: data from the Canadian study of health and aging. *Journal of Gerontology: Medical Sciences* 2001; 56A (11): 693-99.
7. Hogan DB, MacKnight C, Bergman H. Models, definitions, and criteria of frailty. *Aging Clin Exp Res* 2003;15:1-29.
8. Slaets JP. Vulnerability in the elderly: frailty. *Med Clin North Am.* 2006;90: 593-601.
9. IUGM Annual Report 2010-2011. <http://www.iugm.qc.ca/iugm/publication/publications-iugm/rapports-en-ligne>
10. World Health Organization (WHO): Cécité et déficience visuelle, Aide mémoire #282, October 2011. <http://www.who.int/mediacentre/factsheets/fs282/en/>
11. The National Coalition For Vision Health. Foundations for a Canadian Health Strategy. Towards Preventing Avoidable Blindness and Promoting Vision Health. Prepared for the National Coalition for Vision Health. January 2007.
12. Owsley C, McGwin G, Scilley K et al. The visual status of older persons residing in nursing homes. *Arch Ophthalmol* 2007; 125:925-930.
13. Jin YP, Wong DT. Self-reported visual impairment in elderly Canadians and its impact on healthy living. *Can J Ophthalmol.* Aug 2008; 43(4): 407-413.
14. The Eye Diseases Prevalence Research Group. Causes and Prevalence of visual impairment among adults in the United States. *Arch Ophthalmol* 2004; 122:477-85
15. Yamada M, Hiratsuka Y, Roberts CB et al. Prevalence of visual impairment in the adult Japanese population by cause and severity and future projections. *Ophthalmic Epidemiol.* 2010 Jan-Feb; 17(1): 50-7.
16. Abdull MM, Sivasubramaniam S, Murthy GV et al. Causes of blindness and visual impairment in Nigeria: the Nigeria national blindness and visual impairment survey. *Invest Ophthalmol Vis Sci.* 2009 Sep; 50(9):4114-20.
17. Carcenac G, Hérard ME, Kergoat MJ et al. Assessment of visual function in institutionalized elderly patients. *J Am Dir Assoc* 2009; 10:45-49.
18. Coons D.H, Weaverdick S.E. Wesley hall: a residential unit for persons with Alzheimer's disease and related disorders. *Physical and Occupational Therapy in Geriatrics* 1986; 4:29-53
19. Horowitz A. The relationship between vision impairment and the assessment of disruptive behaviors among nursing home residents. *The Gerontologist* 1997; 37:620-28.
20. VanNewkirk MR, Weih LA, McCarthy CA, et al. Cause-specific prevalence of bilateral visual impairment in Victoria, Australia. The visual impairment project. *Ophthalmology* 2001; 108:960-967.
21. Van der Pols J C, Bates C J, Mc Graw P V, et al. Visual acuity measurements in a national sample of British elderly people. *Br J Ophthalmol* 2000; 84:165-170.
22. Coleman AI, Yu F, Keeler E, Mangione CM. Treatment of uncorrected refractive error improves vision-specific quality of life. *J Am Geriatr Soc* 2006 Jun; 54(6): 883-90.
23. Owsley C, McGwin G, Scilley K et al. Effect of refractive error correction on health-related quality of life and depression in older nursing home residents. *Arch Ophthalmol* 2007; 125:1471-1477.
24. Owsley C, McGwin G, Scilley K et al. Impact of cataract surgery on health-related quality of life in nursing home residents. *Br J Ophthalmol* 2007; 91:1359-1363.
25. Friedman DS, Munoz B, Bandeen Roche K, et al. Poor uptake of cataract surgery in nursing home residents. *Arch Ophthalmol* 2005; 123:1581-87.

26. VanNewkirk MR, Weih L, McCarthy CA, et al. Visual impairment and eye diseases in institutionalized Australians. *Ophthalmology* 2000; 107:2203-2208.
27. American Geriatrics Society, British Geriatrics Society, and American Academy of Orthopaedic Surgeons Panel on Falls Prevention. Guideline for the prevention of falls in older persons. *J Am Geriatr Soc* 2001; 49:664-672.
28. O'Loughlin JL, Robitaille Y, Boivin JF, et al. Incidence of and risk factors for falls and injurious falls among the community-dwelling elderly. *Am J Epidemiol* 1993; 137:342-354.
29. Formiga F, Ferrer A, Duaso E, et al. Falls in nonagenarians living in their own homes: The NonaSantfeliu study. *J Nutr Health Aging* 2008; 12:273-276
30. Masud T, Morris RO. Epidemiology of falls. *Age and Ageing* 2001; 30:S4: 3-7.
31. Bezou J, Echevarria KH, Smith GB. Nursing outcome indicator : Preventing falls for elderly people. *Outcomes Manag Nurs Pract* 1999; 3:112-116.
32. Ministère de la santé et des services sociaux: Cadre normatif du système Med-Écho (Maintenance et exploitation des données pour l'étude de la clientèle hospitalière). Québec: Ministère de la santé et des services sociaux; 2009.
33. Summary of the Updated American Geriatrics Society/British Geriatrics Society Clinical Practice Guideline for Prevention of Falls in Older Persons. *J Am Geriatr Soc* 2011;59:148-157.
34. Harwood RH. Visual problems and falls. *Age and Ageing* 2001; 30:S4: 13-18.
35. Dargent-Molina P, Favier F, Grandjean H, et al. Fall-related factors and risk of hip fracture: the EPIDOS prospective study. *Lancet* 1996;348:145-149.
36. Ivers RQ, Norton R, Cumming RG, et al. Visual impairment and risk of hip fracture. *Am J Epidemiol* 2000;152:633-639.
37. Freeman EE, Muñoz B, Rubin G, West SK. Visual field loss increases the risk of falls in older adults: The Salisbury eye evaluation. *Invest Ophthalmol Vis Sci* 2007;48:4445-4450.
38. Lord SR, Dayhew J. Visual risk factors for falls in older people. *J Am Geriatr Soc*. 2001;49:508-515.
39. Boutin T, Kergoat MJ, Latour J, Massoud F, Kergoat H. Vision in the global evaluation of older individuals hospitalized following a fall. *J Am Dir Assoc*. 2011. Sous presse.
40. Knudtson MD, Klein BEK, Klein R. Biomarkers of aging and falling: The BeaverDam eye study. *Arch Gerontol Geriatr* 2009; 49:22-26.
41. Lord SR, Clark RD, Webster IW. Physiological factors associated with falls in an elderly population. *J Am Geriatr Soc* 1991; 39:1194-1200.
42. Glynn RJ, Seddon JM, Krug Jr JH, et al. Falls in elderly patients with glaucoma. *Arch Ophthalmol* 1991; 109:205-210.
43. Jack CI, Smith T, Neoh C, Lye M, et al. Prevalence of low vision in elderly patients admitted to an acute geriatric unit in Liverpool: Elderly people who fall are more likely to have low vision. *Gerontology* 1995; 41:280-285.
44. Brannan S, Dewar C, Sen J, Clarke D, Marshall T, Murray PI. A prospective study of the rate of falls before and after cataract surgery. *Br J Ophthalmol* 2003;87:560-562.
45. De Coster C, Dik N, Bellan L. Health care utilization for injury in cataract surgery patients. *Can J Ophthalmol* 2007;42:567-572.
46. Harwood RH, Foss AJE, Osborn F et al. Falls and health status in elderly women following first eye cataract surgery: A randomized controlled trial. *Br J Ophthalmol* 2005; 89:53-59.
47. Foss AJE, Harwood RH, Osborn F, Gregson RM, Zaman A, Masud T. Falls and health status in elderly women following second eye cataract surgery: A randomised controlled trial. *Age Ageing* 2006; 35:66-71.
48. Desapriya E, Subzwari S, Scime-Beltrano G, Samayawardhena LA, Pike I. Vision improvement and reduction in falls after expedited cataract surgery. Systematic review and metaanalysis. *J Cataract Refract Surg*. 2010;36:13-19.
49. Lord SR, Smith ST, Menant JC. Vision and falls in older people: Risk factors and intervention strategies. *Clin Geriatr Med* 2010;26:569-581.
50. Bennet AG. Ophthalmic test types. *Br J Physiol Opt* 1965; 22: 238-271.
51. Bailey IL, Lovie JE. New design principles for visual acuity letter charts. *Am J Optom Physiol Opt* 1976; 53: 740-745.
52. Ferris FL, Kassof A, Bresnick GH, Bailey I. New visual acuity charts for clinical research. *Am J Ophthalmol* 1982; 94: 91-96.
53. Kassof A, Goodman D et al. Early treatment diabetic retinopathy study design and baseline patient characteristics. *Ophthalmol* 1991; 98: 741-751.
54. Hyvarinen I, Nasanen R, Laurinen P. New visual acuity test for pre-school children. *Acta ophthalmologica* 1980; 58: 507-511.
55. Becker R, Hubsch S, Graf MH, Kaufmann H. Examination of young children with Lea symbols. *Br J Ophthalmol* 2002; 86: 513-516.
56. Chandna A, Karki C, Davis J, Doran RML. Preferential looking in the mentally handicapped. *Eye* 1989; 3: 833-839.
57. Teller DY. The forced-choice preferential looking procedure: a psychophysical technique for use with human infants. *Inf Behav and Dev* 1979; 2: 135-153.
58. Teller DY, McDonald M, Preston K, Sebris SL, Dobson V. Assessment of visual acuity in infants and children: the acuity card procedure. *Dev Med and Child Neurol* 1986; 28: 779-789.
59. Marx MS, Werner P, Fridman P and Cohen-Mansfield J. Visual acuity estimates in the aged. *Clin Vis Sci* 4:179,1989.
60. Marx MS, Werner P, Cohen-Mansfield J, Hartmann EE. Visual acuity estimates in non-communicative elderly persons. *Invest Ophthalmol Vis Sci* 1990;31: 593-596.
61. Friedman DS, Munoz B, Wassof RW et al. Grating visual acuity using the preferential-looking method in elderly nursing home residents. *Invest Ophthalmol Vis Sci* 2002; 43: 2572-2578.
62. Carabellese C, Appollonio I, Rozzini R, Bianchetti A, Frisoni GB, Frattola L, Trabucchi M. Sensory impairment and quality of life in a community elderly population. *J Am Geriatr Soc* 1993; 41:401-7.
63. Rovner BW, Zisselman PM, Shmueli-Dulitzki Y. Depression and disability in older people with impaired vision: a follow-up study. *J Am Geriatr Soc* 1996; 44:181-184.
64. Chriqui E, Kergoat MJ, Champoux N, Leclerc BS, Kergoat H. Évaluation de l'acuité visuelle chez la personne âgée atteinte de troubles cognitifs. Canadian Association on Gerontology. Ottawa 2011.