Insufficient Lighting in Nursing Homes

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Objectives: The objective of this study was to measure the level of lighting in nursing homes in a variety of areas to determine its adequacy in meeting the visual needs of elderly residents.

Design: Observational study

Participants: Eight nursing homes cooperating in an intervention study designed to prevent accidental falls.

Measurements: The amount of light was measured in eight nursing homes with a lux meter DVM 1300 Vellemann. The intensity of light was measured at four moments: a sunny day, a cloudy day, while dusk was falling, and while it was dark. At each moment, the amount of light was measured in 16 different places frequently used by residents. The European Standard for light and lighting of indoor work places (EN 12464-1:2002) was used for reference. Because aged persons require more light than persons twenty years of age, the European Standard was adapted by increasing it 55%. Results were compared to both the European Standard (ES) and the Adapted Standard (AS).

Results: On a sunny day, the amount of light met the ES in 5 of the 8 nursing homes and met the AS in 1 of the 8 nursing homes in at least 8 of 16 places. On a cloudy day, the amount of light met the ES in 2 of the 8 nursing homes in at least 8 of 16 places, and no nursing home met the AS in at least 8 of 16 places. According to the AS, the amount of light was insufficient at both other moments in all institutions.

Conclusion: The amount of light in the nursing homes was seldom sufficient to meet the visual needs of older people. This lack of illumination may induce a higher risk of accidental falls for dementia patients as well as for other residents. (J Am Med Dir Assoc 2007; 8: 314–317)

Keywords: Accidental falls; dementia; nursing homes; vision

Lighting levels in the homes of many elderly people have been shown to be inadequate. Levels of illumination in one nursing home were found to be insufficient both for working and the well being of healthy adults and definitely for frail older people.

Lighting levels in health care facilities are crucial for several reasons. First, the lighting level is important because it affects residents’ sleep patterns and activity rhythms, and it is also shown to be a contributing factor in behavioral problems. Research has confirmed the importance of vision in maintaining postural stability. Dim lighting levels appear to be associated with a poorer postural stability in older people and so may be associated with an increased risk of falls. Falls are one of the major causes of disability and mortality in the elderly and, therefore, represent an important health problem. Fall prevention strategies, then, are not only a topical but a crucial subject. It is recognized that visual environmental factors such as poor lighting may contribute to falls. Blurred vision has been shown to be an important risk factor for falls. Study findings, such as the large Beaver Dam Eye Study, indicate that impaired vision is a significant and independent risk factor for falls.

On the other hand, there is a generalized reduction in visual functioning with advancing age, which increases the risk of falls. It appears that older people need more light compared with younger persons. To see objects clearly, older people need more contrast. The elderly also require more time to adapt visually to the dark. Impaired dark adaptation may leave an elderly person virtually blind for a minute or more upon moving from a bright room to a darker area. A study in the United Kingdom registered that 4% to 12% of community-dwelling older people report having less than excellent vision. In the Netherlands, 150,000 to 200,000 people suffer from avoidable visual impairments. A study comparing elderly fallers and nonfallers indicated reduced retinal sensitivity and hence impaired dark adaptation in the falling group. People with mental problems, older people in nursing homes, and people with problems of diabetes and macular degeneration are at increased risk. A study among older women indicated that loss of vision increases the risk of falls. Prevention or correction of visual loss may help to reduce the number of future falls. A study by van Bemmel et al indicated that older persons without a history of

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by increasing the European Standard by 55% (Adapted Stan-

dard).

amount of light met the standards at each of the 4 measurement

RESULTS

both standards.

after the age of 20 years,15 a second reference was generated

need for light increases inevitably at the rate of 1% per year

ORIGINAL STUDIES De Lepeleire et al.

Data Collection

METHODS

We asked a sample of nursing homes for the elderly that

were collaborating within the Qualidem study in Flanders, a

region of Belgium, to participate in this study of lighting and

its impact on the risk of falling.20 The assessment was carried

out between April 6 and April 23, 2004. The amount of light

was measured with a lux meter DVM 1300 Velleman (Velle-

man, Inc., Fort Worth, TX). Illumination levels were measured

at 4 moments: a sunny day, a cloudy day, while dusk was falling,

and while it was dark. At each moment, the amount of light was

measured in 15 different places frequently used by residents:

entrance hall, reception, sitting area, corridors, public toilet,

cafeteria, hairdresser, occupational therapy room and physio-

therapy room, stairs, elevator, dining room, bathroom, kitchen,

and private rooms of the elderly individuals. In larger

rooms, corridors, stairs, dining rooms, sitting area, and cafe-

teria, a minimum and a maximum value were measured. The

measurements were performed in the current situation: no

additional lights were switched on (with exception of the

toilets and bathrooms). The measurements were performed

twice, and the data were averaged.

Analysis

The European Standard for light and lighting of indoor

work places21 (ES) was used for reference. As an individual’s

need for light increases inevitably at the rate of 1% per year

after the age of 20 years,15 a second reference was generated

by increasing the European Standard by 55% (Adapted Stan-

dard = AS). In Table 1, lighting requirements are shown

according to the ES and the AS. Results were compared with

both standards.

RESULTS

For each nursing home, the percentage of areas where the

amount of light met the standards at each of the 4 measurement

moments showed considerable variation. Compared with the

ES, that percentage varied from 40% to 80% on a sunny day,

13.3% to 53.3% on a cloudy day, and a maximum of 20% at

dusk and dark. The percentage of rooms meeting the AS varied

from 20% to 60% on a sunny day and 20% to 33% on a cloudy
day, to a maximum of 13% at dusk and dark. On a sunny day,
the amount of light met the ES in 5 of the 8 nursing homes and

the AS in 1 of the 8 nursing homes in at least 8 of 16 places.

On a cloudy day, the amount of light met the ES in 2 (25%) nursing

homes in at least 8 of 16 places, and no nursing home met the

AS in 50% of places. The amount of light was insufficient at the

2 other moments in all facilities.

Table 2 shows, for each type of room, the number of

nursing homes where the amount of light was sufficient to

meet the AS. On a sunny day, the amount of light is sufficient

at the entrance of all the nursing homes. In most other places,

the amount of light met the required level if a maximum value

was measured. In all other places, with the exception of the

beds in the residents’ rooms, the measured values were insuf-

ficient when compared to the AS. On a cloudy day, again,

only the maximum values and the values at the beds met the

AS in most nursing homes. During the evening and at night,

the amount of light was insufficient at most places.

It was noted that the nursing homes are equipped with a

sufficient light installation at various places, but these lights

are often inadequately used.

DISCUSSION

These results show that the lighting in nursing homes is

seldom adapted to the visual needs of older people. The

measured values do not even meet the values of the ES, which

is designed for healthy adults. For employees, as well, the

lighting is therefore insufficient. Only maximum values, mea-

sured near windows, were sufficient according to the stan-

dards. It is obvious that even minimum values, especially in

places where residents are likely to encounter a higher risk of

falls (eg, in corridors, stairs, dining rooms, toilets, bathrooms),

should meet the standard for older people (AS), which they

largely fail to do.

In order for older people to maintain good visual perception,

besides the amount of light, contrast and reflection are crucial.

It was noted that in a few nursing homes, walls in the corridors

are grey and the lighting is indirect, so the available light is not

reflected properly for adequate contrast and maintenance of

good perception in these areas. Indirect lighting can result in a

solid lighting but only when it can be reflected on a bright wall

and ceiling. High contrast, overall, results in better visual per-

ception. Reflection is also an important factor, as bright walls

can reflect more light and consequently provide a higher level of

perception. Visual perception when glaring is created.

Because of the delayed dark adaptation experienced by the

elderly, light levels in bathrooms and toilets are extremely

important. The lighting levels in this study were higher than

those observed in a similar group in the same region.7 Other

similar studies were not found.

The small sample of nursing homes used in this study was

not a statistically random sampling of nursing homes. How-

Table 1. Recommended Lighting in 8 Places According to the

European Standard and an Adapted Standard

<table>
<thead>
<tr>
<th></th>
<th>European Standard, lux</th>
<th>Adapted Standard, lux</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance halls</td>
<td>200</td>
<td>310</td>
</tr>
<tr>
<td>Reading and sitting area</td>
<td>500</td>
<td>775</td>
</tr>
<tr>
<td>Corridors:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>During the day</td>
<td>200</td>
<td>310</td>
</tr>
<tr>
<td>During the night</td>
<td>50</td>
<td>77.5</td>
</tr>
<tr>
<td>Bathrooms and toilets for patients</td>
<td>200</td>
<td>310</td>
</tr>
<tr>
<td>Cafeteria, dining room</td>
<td>200</td>
<td>310</td>
</tr>
<tr>
<td>Stairs, escalator</td>
<td>150</td>
<td>232.5</td>
</tr>
<tr>
<td>Rooms: General lighting</td>
<td>100</td>
<td>155</td>
</tr>
<tr>
<td>Rooms: Table and chair</td>
<td>500</td>
<td>775</td>
</tr>
</tbody>
</table>
ever, the sample did consist of nursing homes from the 3 current types existing in the region of Flanders—nonprofit, private, and public—and included both large and small facilities.

A correlation has been shown to exist between vision impairment and the risk of accidental falls.13,22 The pathophysiology of vision impairment, however, is complex and often not very well understood.23 One of the pertinent elements involved is dark adaptation, which seems to be diminished significantly in the elderly.1 In the registration of accidental falls in the nursing homes of this study, the highest risk of falling was noted to occur around 6:00 PM, when light intensity is changing.24,25 When confirmed in other studies, these results stress the importance the role adequate lighting plays in the prevention of accidental falls among nursing home residents.

The direct importance of lighting, though, must be qualified. First, other elements besides lighting contribute to impaired vision, such as contrast, color, reflectiveness, optic illusions, insidious cataracts, and others. Secondly, lighting is not at every moment or every place equally important; for example, one needs more light for proper reading than for bathing. Thirdly, the level of lighting must also be adequate for the nursing home staff to function professionally in the workplace. Last, the level of lighting is also a contributing factor in other important clinical problems in nursing homes, such as sleep disorders and behavioral problems.4

**CONCLUSION**

This study found that the amount of light in the participating nursing homes was seldom sufficient to meet the visual needs of older people. This lack of necessary illumination may induce a higher risk for accidental falls and contribute to other clinical problems for nursing home residents. Further attention and research are needed to determine the adequate levels of lighting in nursing homes.

**ACKNOWLEDGMENTS**

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**REFERENCES**


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Table 2. Number of Institutions (N = 8, %) Where the Amount of Light Is Sufficient According to the Adapted Standard for Each Type of Room

<table>
<thead>
<tr>
<th>Room</th>
<th>Sunny Day</th>
<th>Cloudy Day</th>
<th>Dusk</th>
<th>Dark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance hall</td>
<td>8 100%</td>
<td>3 37.5%</td>
<td>2 25%</td>
<td>1 12.5%</td>
</tr>
<tr>
<td>Reception</td>
<td>0 0%</td>
<td>4 50%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Sitting area ward</td>
<td>1 12.5%</td>
<td>1 12.5%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Sitting area entrance hall</td>
<td>1 12.5%</td>
<td>0 0%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Corridor</td>
<td>1 12.5%</td>
<td>0 0%</td>
<td>1 12.5%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Toilets</td>
<td>7 87.5%</td>
<td>8 100%</td>
<td>0 0%</td>
<td>1 12.5%</td>
</tr>
<tr>
<td>Cafeteria</td>
<td>3 37.5%</td>
<td>1 12.5%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Max</td>
<td>8 100%</td>
<td>7 87.5%</td>
<td>0 0%</td>
<td>1 12.5%</td>
</tr>
<tr>
<td>Hairdresser’s</td>
<td>2 25%</td>
<td>2 25%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Room for occupational therapy</td>
<td>2 25%</td>
<td>2 25%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Room for physiotherapy</td>
<td>2 25%</td>
<td>0 0%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Stairs</td>
<td>8 100%</td>
<td>8 100%</td>
<td>0 0%</td>
<td>1 12.5%</td>
</tr>
<tr>
<td>Elevator</td>
<td>4 50%</td>
<td>4 50%</td>
<td>0 0%</td>
<td>4 50%</td>
</tr>
<tr>
<td>Dining room</td>
<td>3 37.5%</td>
<td>0 0%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Max</td>
<td>8 100%</td>
<td>8 100%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Bathroom</td>
<td>2 25%</td>
<td>1 12.5%</td>
<td>1 12.5%</td>
<td>1 12.5%</td>
</tr>
<tr>
<td>Kitchen</td>
<td>0 0%</td>
<td>0 0%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Bed</td>
<td>7 87.5%</td>
<td>7 87.5%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
<tr>
<td>Table and chair</td>
<td>5 62.5%</td>
<td>3 37.5%</td>
<td>0 0%</td>
<td>0 0%</td>
</tr>
</tbody>
</table>

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In some rooms a minimal level (eg, far from the window) and a maximum level are noted. —, such rooms were not available at that time.


