

# A Redesigned Safe Walking aid for Aging HIV Patients

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## Abstract

The purpose of this study was to describe the perception of aging HIV patients living with morbidities affecting their regular walking and offering a product-based solution designed based on interaction with respondents. This walking stick is proposed functional design for a glow light walking stick for aging HIV patients for which perception was collected through structured questionnaire. The study population included HIV patients affected by accelerated aging and their primary caregivers. Primary data was collected through structure questionnaire and interviews with focus group. Product design was shown to all respondents. Questionnaire was distributed to 315 respondents out of which 201 responses were found valid for the study. Interviews were conducted in 10 focus groups of 5 each separately for collecting qualitative data on proposed product design. Out of 50 interviews, 47 responses were found valid for inclusion in the study. The data analysis presented various challenges described by respondents while walking as major issues in the mobility. Analysis of the results of the survey and discussions showed a positive perception about the proposed design that facilitates aging patients with HIV to go out for a walk or want to move around freely, darker stretch ways and lack of lighting, or access to light switches act as a hurdle to their free and safe movement. The design patent was also filed during the research. This glow light walking stick (patent filed application no. 356250-001) will provide a safe and free environment to elderly to move and facilitate the caregivers as well.

**Keywords:** Aging Patients, HIV patients, Elderly people, Safety aid, Walking Stick, Glow Light

## 1. Introduction

Elderly people are the foundations of the healthy societies. There is an increasing concern due to rising global trend of aging population. As per report by UNAIDS, estimated 4.2 million people over the age of 50 i.e approximately 13% of all people living with HIV are living with virus. HIV, the disease whose transmission mode is known and preventable is still spreading at high pace (Meena, Pandey, Rai, Bharti & Sunder, 2013). An integrated approach to provide better health care services are encouraged, and necessary to improve quality of life for HIV patients and decrease the stigma associated with the disease (Shukla, Muchomba & McCoyd, 2018). Despite the tremendous advancements in HIV drugs that now enable most people to live longer and healthier lives with HIV, there are several ways in which living and aging with HIV are different from aging while being HIV-negative (Cardoso, Torres, Santini-Oliveira, Marins, Veloso & Grinsztejn, 2013). A people centered approach is required grounded on the principles of safe environment, humanity, dignity and equity is required. For which it is important to create a support system for the aging HIV patients and the caregivers. Thus, enhancing their mobility Fig 1. shows world population under the age of five years and those older than 65. While the under-five population has held relatively steady for the last two decades, the above 65 population has only risen (Ungarino, 2019)

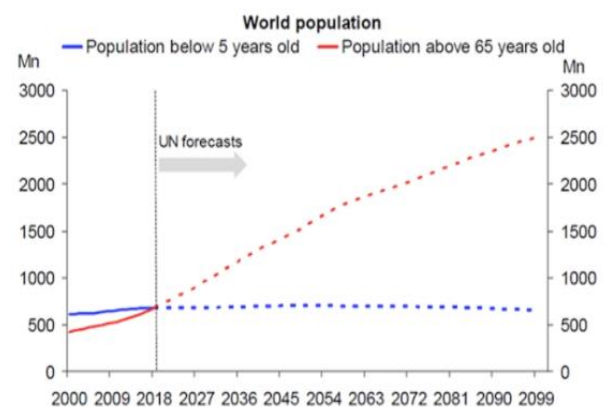


Fig 1. The World Population under the age of 5 years and above the age of 65 years

Source: United Nations, Haver Analytics, DB Global Research, Deutsche Bank

## A. Definition of 'Elderly people'

In the elderly stage, the following classification was given by Arber and Ginn (Liu, 2016) on the basis of the period associated with chronological age-young elderly (65-74 years old), old elderly (over 75 years old), and the oldest old (over 85 years old). Patients with HIV show accelerated aging challenges starting from 50 years.

The health and safety concerns limit elderly population contribution and independence. Fig 2. shows the changes in the muscles with aging. There are many biological changes that come in the body with age due to wide variety of molecular and cellular damage over time in the elderly people.

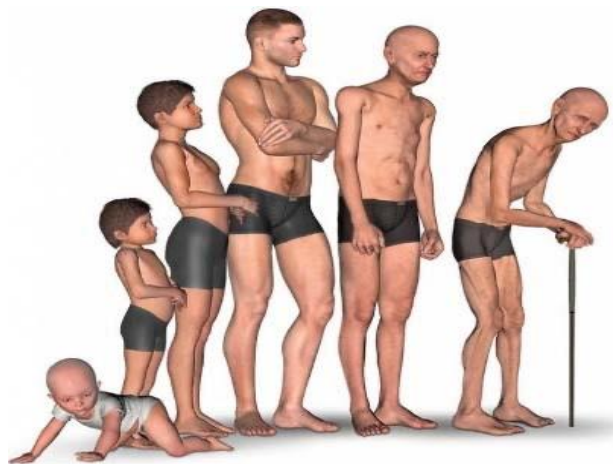


Fig 2. Muscle changes by aging

Source: Ignatavicius DD, Workman ML: Medical-surgical nursing: patient centered collaborative care, ed 6, Philadelphia, 2010, WB Saunders. Data from Sattin RW, Easley KA, Wolf SL, et al: Reduction in fear of falling through intense tai chi exercise training in older, transitionally frail adults, *Journal of the American Geriatrics Society* 53:1168, 2005.)

The difficulty in walking is also common in old age. Like other functional limitations, it is related to poor psychological state (Benktzon,1993) and has the risk factors that comprise of general functional decline including disease burden(comorbidity), lifestyle, low levels of activity, low social contact and cognitive impairment (Pande, Kenjale, Mathur, Daniel, Kumar & Mukherjee, 2020) and (Dabir, Solkar, Kumbhar & Narayanan, 2018). There are places and pathways with no lights, or which are totally dark. Also, when they get up at night for any basic requirements like taking medicine, using washroom etc, it is difficult for them to move to the switch board for the light or at times they are not able to locate it (Schroeder & Gefenas,2009) and (Garcia,2009). The movement of aging population is restrained due to these functional limitations. The present study addressed the problem faced by aging population to move and walk safely with the safety aid as it is unsafe for them to go outside on the streets or parks for walk without safety aids.

Traditionally, a walking stick for the support is available as medical equipment. The elderly people need to find the access to lights to move around in the home, and more often compromise on their safety while taking evening walks. They must sometimes carry extra torch or use mobile handsets as torch which makes it difficult for them to walk safely. Our limited survey to find solution to the problem raised by respondents could not identify any such support product/equipment like our proposed stick in the market for this purpose.

The objective of this study was to describe the experiences of the HIV affected aged people living with co-morbidities affecting their regular walking with a proposed walking stick. Based on their experience sharing and feedback, design of the product of was made. The proposed design has the LED light button on the top of the walking stick. On

pressing the button, the LED on the rod of the walking stick gets switched on and thus, facilitates elderly people to walk comfortably in light without any risk. Added feature of the radium lights is also given around the rod to make it glow at night for easy access. With the proposed walking stick, not only the elderly but also anyone who needs the support of the stick to walk will be able to move safely in the darker areas. This will also help them to be independent while moving around.

## 2 Literature Review

Health care professionals in the medical facilities use various strategies to improve equilibrium in the aging HIV patients. But the caregivers and elderly need to manage their daily routines and chores at their homes independently. There are challenges not only in social inclusion that are related to mental health, but also physical symptoms and impairments faced by these patients (O'Brien, Davis,Gardner, Bayoumi,

Rueda,Hart,Cooper,Solomon,Rourke,Hanna,2014). Disequilibrium is defined as discomfort or dizziness that may occur from a variety of age-related causes (Stuck, Walthert, Nikolaus, Bula, Hohmann & Beck,1999) and (Garçon, Khasnabis, Walker, Nakatani, Lapitan, Borg, Ross, & Berumen, 2006). The physical and social environment, which is supportive is an imperative for the elderly people. There are many kinds of assistive devices which are available for the support to facilitate the functioning of the elderly people.

With the advancement in research and development, innovative technologies are being adopted to create advanced devices. These new technologies are expensive, due to which these have limited access to aging HIV patients and elderly population. Walking sticks are also one of these. There are many sticks available which are aligned with the parameters of various medical requirements.

The proposed stick uses simple design to provide easy access to the masses to have a safe movement. More features in the stick can increase the mobility and confidence of aging HIV patients and reduces fear of walking. Many a times this fear of mobility and unsafe passages are the cause of accidental fall and injury in the patients (Graber,2011). The walking stick is a useful aid for the elderly ensuring their safety. By paying more attention to these aids we will enable elderly people to walk with less discomfort and fear. The elderly patients avoid the darker pathways during their walk as well as they depend on the caregivers to do their basic tasks. They cannot walk safely to perform their routine tasks, as well as they need support for their movement from one place to another (Edwards & Jones,1998).

The use of the proposed device is not restricted or limited to just elderly only. In contrast, any individual who needs support to walk due to accident or disability can use it too. Use of this device would enable them to be self-dependent and comfortably move around.

### 3. Proposed Solution in Form for A Product Design

Traditionally, the support stick for elderly restricted the movement (Wong, Wong, Pang, Azizah, & Dass, 2003). Also known as ‘Assistive Cane’ is used as a crutch or a mobility aid. This mobility aid can facilitate elderly by redistributing their weight and provide stability by the increased base support (Sainsbury & Mulley, 1982).

The proposed solution of a safety aid for aging HIV patients- a walking stick as represented by Fig 3. gives them ease of movement, access and is designed for easy handling. A traditional walking stick has aluminium rod and a holder on the top with wooden or plastic handle. In a proposed design, LED light and radium lights are added to facilitate elders to walk safely in the dark and low light areas. LED switch is placed below the handle which is battery operated.

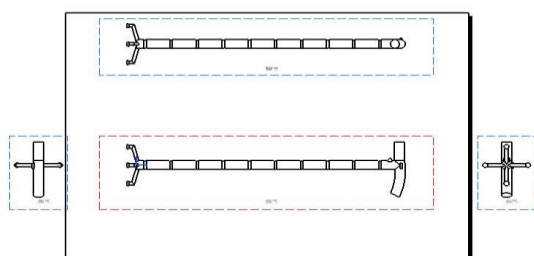


Fig 3. A proposed design of the safety aid-Glow Light Walking Stick for Aging HIV patients

Source: Authors’ original design drawing

Advantages of the Proposed Design-The advantages of the proposed design in comparison with the traditional stick includes-easy accessibility, risk reduction, Convenience in handling and less efforts. The user will have easy access to surroundings in the dark because of the radium lights fitted around the rod. Also, this design will decrease the risk for any untoward incident with elderly when they go for a walk, or they move around. Thus, it is easy to handle design that will facilitate, and support aging HIV patient’s needs. Consecutively, it doesn’t require any effort to carry other devices or physical movements to locate for light switch boards.

Drawbacks of other Designs-In the market, there are lot of innovative gadgets and safety aids are available. But due to high end technologies being used these carry certain limitations. The designs of the walking sticks that are available have the following drawbacks: Expensive, unavailability and uses. The high-end technologies like chip-based walking sticks with sensors are highly expensive, thus limiting the usage. High percentage of aging population goes for affordable safety aids. The aging and elderly people prefer to carry safety aids which serve the purpose of support and are easily available. In the case of high-end safety aids, there availability is limited. The aging population deals with functional and physical decline, and other comorbidities (Emlet,1997). The safety aids which use various

technologies have complex functioning. Mostly, patients and elderly people prefer aids which are easy to use and simple to carry.

In comparison to the other alternatives, the proposed walking stick is user friendly. Also, with inbuilt LED light acts as a torch for the elderly which uses battery thus eliminates the extra effort to carry another torch/device in hand. Due to age concerns and reduced equilibrium, it becomes essential for elderly people to not to multitask for their own safety. This is economical alternative to smart sticks as it meets the basic requirements of support and light. The proposed design in comparison to existing sticks is given in the Fig 4.1 and Fig 4.2. Fig 4.1 shows the top of the stick with LED lights below the handle for torch light and Fig 4.2 represents the vertical view of the stick with LED light and radium lights placed on the stick.



Fig 4.1 Proposed design for a Glow Light Walking Stick for Aging HIV patients

Source: Authors’ original design drawing

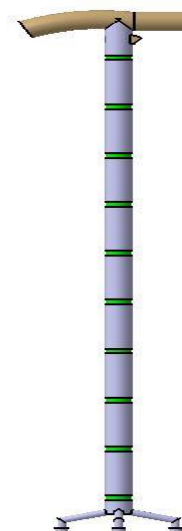


Fig 4.2 Proposed design for a Glow Light Walking Stick for Aging HIV patients (Vertical View)

Source: Authors’ original design drawing

### 4. Research Method and Analysis

The research study aims to determine the perceived benefits of the proposed walking aid. The population of the study includes aging HIV patients and their caretakers. The first-hand observation method is

used to understand the challenges of the aging population with HIV while moving around at home and going outside for the walk (Bhatta, Nandi, Dutta, Dutta & Saha, 2020). Further supported by the questionnaire consisting of 3 sections – Section I consists of demographics, Section II created to determine the Perception of fear, independence and confidence, and Section III is created to capture the critical incidents and challenges faced by the patients and the caregivers. In Section II, perception of fear, independence and confidence was measured on the likert-type scale, as 0=no importance, 1=unimportant, 2=do not matter, 3=important and 4=very important (Zikmund, Babin, Carr & Griffin, 2003). Also, the focus group method is used for discussions with the aging patients with HIV who were already using the walking stick, or any safety aid for the support and balance while moving.

### A. Perceptual study of the Aging HIV patients

A study was conducted with a purposive sample size of 315 aging patients with HIV above the age of 60 years. Data was collected through questionnaire and interview method in focus groups. Total number of 315 respondents were approached. Responses of 201 questionnaires were found valid for inclusion in the study. 10 focus groups of 5 each respondent was observed. Out of 50, 47 responses were considered for analysis. Scope of the research was limited to NCR, Punjab, Haryana and Himachal Pradesh. The aging HIV patients, who were already using the traditional stick were selected for the testing. The product design was introduced to them which replaced their traditional stick. While conducting the research, the data related to the challenges faced by them was collected and analysed in the Fig.5.

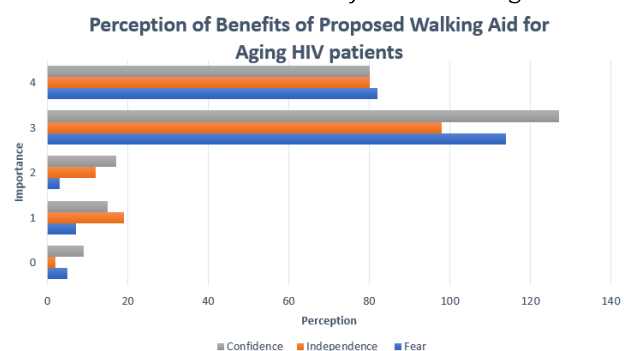


Fig.5. Analysis of the proposed design of the stick for the aging HIV patients

Three main factors were considered for the study. These were- mobility of elderly, perception of fear, accident or injury, and confidence in the self. The interviews were conducted to understand the change in their mobility, fear of accident or injury, and confidence to move independently especially at night and in low-light areas. The results revealed significant increase in self-confidence, decrease in fear, and smooth mobility.

As shown in Fig.5, a significant percentage (94%) of the aging patients surveyed perceived less fear due

to light that proposed stick radiates and inbuilt torch. The safety aid has the radium lights attached that makes it glow in the night for easy access. Additionally, there is button on the top of the walking stick, which when switched on will work as a torch to light up the dark spaces. The entire mechanism is installed at the top of the stick and radium lights are extended across the entire length of the stick. Also, it is easy hand-held support stick with light. More than 87% elderly people surveyed agreed to increase mobility. Also, they were able to do their daily chores and tasks independently. 84% of the elderly surveyed reported increase in their confidence with increased mobility and independent functioning.

The usability of device also makes it desirable to not only elderly people but any especially abled people to walk with support in light. Thus, creating a safe pathway for them to move on their own. Instead of carrying various other devices such as torch, mobile with torch, bed switch for light with limited usability in particular environment (Bowling & Grundy, 1997), they can carry one Glow Light Walking Stick. Also, it is difficult for aging patients to hold on torch/mobile with torch along with walking stick when they go for walk or move around, but with the help of this Glow Light Walking Stick it will be easier for them to walk comfortably in light without any risk.

### 5. Conclusion

To encapsulate, many aging HIV patients rely on the cane stick or a walking stick to avoid balance loss due to weak legs, which may lead to fall or injury. It is important to build communities and provide sustainable solutions which are economic and provide safety to the HIV patients (WHO, 2014). In this paper we have presented a new design that is simple, and affordable (Boone, 1996). Also, this safety aid is designed to eliminate the flaws of traditional design of walking stick used for the support of the affected individuals/ elderly. The HIV patients especially in elder age (Durvasula, 2014) have to face many limitations due to accelerated aging. These factors start playing the predominant role in their daily routines which lead to stagnant lifestyle, unwillingness to move and low confidence in the self. The caregivers also have to monitor their parents and relatives, thus demanding time and resources. Due to this dependence, the mental health issues may add up to more functional disadvantages (Durvasula, 2014). Taking these aspects into the consideration, the proposed design is created. One of the most significant advantages of this new design of a walking stick is that it can be used by not only by elderly but any individual needing support to walk. The stick with its LED torch light and radium lights on the rod will provide them safety and lit up paths, and thus make their movement smooth. This will help build the confidence in the aged people to pursue their daily chores independently, without fear and feeling of being dependent on the other people (Chen, Meng,

Li, Sun & Wang,2021) and (Lachtar, Kachouri & Val ,2017). This product is expected to find high acceptance by users because of its ease to carry design with inbuilt light. Furthermore, the design that is proposed can be used widely by charitable trust and NGOs to facilitate the elderly and aging population with HIV. The authors have designed the product to ensure safe movement of the aged people so that they can lead a healthier and independent life. Their dependability on caregivers will reduce with this support aid (Almeida, Zhang & Liu, 2007). The design also provides the affordability feature. This will not only ensure the safe support aid to the aging population but also to the patients facing other medical conditions and are unable to move without support or a walking stick. Thus, children with birth deformities as well as patients with temporary medical conditions will also be benefitted.

## 6. Implications and future scope

There is a high percentage of aging population and elderly suffering with HIV who rely on the walking stick. The Glow Light walking stick will-

- Facilitate the safe walk for elderly people irrespective of visibility constraint.
- provide more fulfilling walking experience and feeling of being independent in handling their daily chores.
- provide more comfortable movement and lifestyle due to confidence in self and high morale.

Also, caregivers will be able to support elderly without making them feel being dependent on anyone for their routine tasks and strolls around. Also, children with birth deformities as well as patients with temporary medical conditions will also be benefitted.

The future scope of the proposed design includes prototyping and commercialization for coverage of the target market. Further alignment with the cost-effective technologies will also enhance the usability and benefits of the proposed design for aging HIV patients, senior citizens, especially abled children as well as patients with comorbidities.

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