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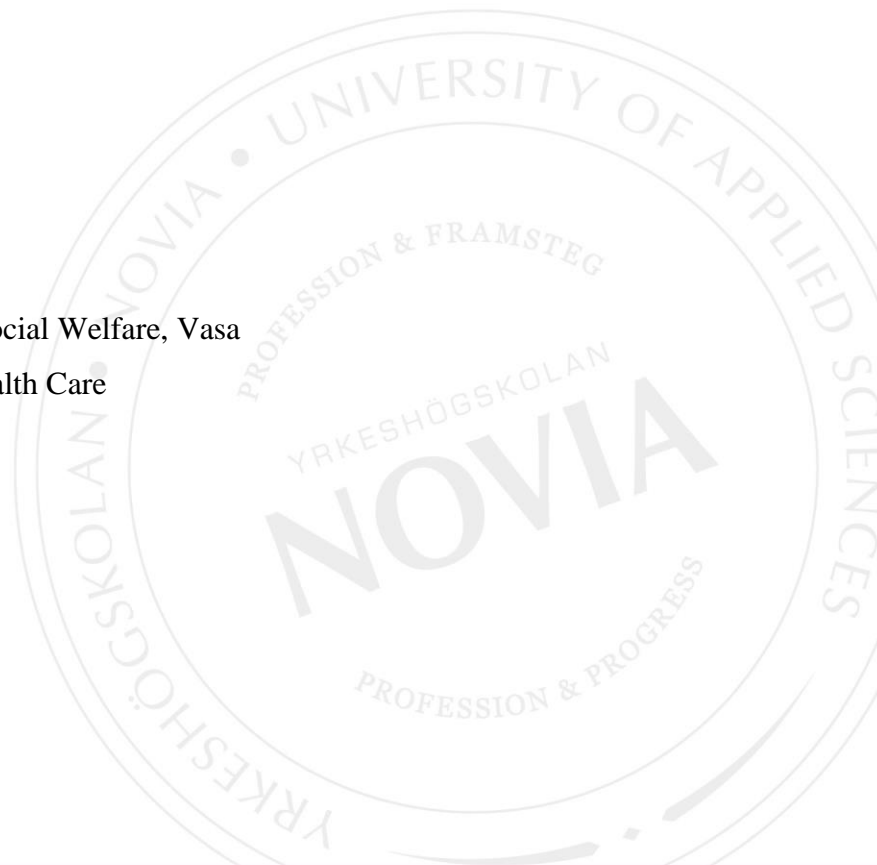**Describing how technology can help nurses in providing care in elderly settings.**

A systematic literature review

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BACHELOR'S THESIS

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Summary

Nurses plays an important role in promoting elderly care and supporting their health and their overall functionality regularly. It involves monitoring of vital signs, long term diseases, and their mental and physical functions. The study is to describe how technology can help Nurses to cope with care needs of growing elderly population. The study can be useful for nurses on ways to reduce workload by use of technology. Aim is to explore how technology incorporation in elderly care help elderly to live safe and secured independently while reducing burden and workload on health care professionals. The study was investigated by systematic literature review using qualitative systematic literature review. Inductive and deductive methods were used to find the correct information. Katie Eriksson Caritative care theory was used as background on concept of care which provide guideline on how real care is done by caritas. Three themes were discussed in this study which are Assistive technology, monitoring technology and Social assistive robot

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Table of Content

1 Introduction

Ageing population is increasing in most of developed countries caused by long life expectancy as a result of healthy living, high living standard and advance in medicine. Ageing comes with challenges like decline in cognitive and physical function which leads to challenge in living independently. With increase elderly population long term sustainability of elderly care is required. (Watanabe et al, 2017)

A growing elderly population cause a major serious impact on social welfare systems. The current generation will be burdened by number of elderlies who need care and support. Economic situations are now burdened by limited time and scarcity of human resource. As population age a burden is put on working population to provide support needed. This will lead to decrease in productivity that lead to increase in healthcare cost and service. (Sciegaj & Behr, 2010).

In Europe nine out of ten elderly would like a home or community base care than hospitalization. They want to spend retirement on their homes. It's important they have good and quality care in their own home since it increases their independence. (Kouta et al, 2015). To ensure the best care for elderly it is important for health care professional to become familiar with common threats like loneliness and depression. The gap between elderly population and limited home care service provider will affect the quality of care. In order to make quality care possible implementation of technology is believed to reduce nurse's workload and enables elderly self-care. (Kachouie et al, 2014)

Many studies show promising contribution of technology in caring for elderly. Most of technological development are focusing on supporting elderly to make living independently possible. Most of European countries use technology like safety sensors, geographical positioning systems (GPS), remote monitoring systems and safety alarms. Example Technical Research Centre of Finland Ltd (VTT) has a lot of projects and research on the use of technology in elderly care in collaboration with Japan.

2   Background

2.1   Ageing

This section will include ageing definition and factors associated with ageing. Ageing is defined as a decline or loss of adaptation with increasing age. This is caused by a time progressive decline of scaling forces of natural selection. (Thomas Flat, 2012). Ageing is a factor to increased governments expenditure and fund allocation in elderly. With increasing elderly population means more expenditure on elderly health care. According to United Nation UN, (2017) (world population review) "the number of older persons those aged 60 years or over is expected to more than double by 2050 and to more than triple by 2100, rising from 962 million globally in 2017 to 2.1 billion in 2050 and 3.1 billion in 2100. Globally, population aged 60 or over is growing faster than all younger age groups."

2.2   Elderly care

As defined by Cambridge Dictionary, "Providing care and assistance to elderly who need help with daily activities or medical problems".

Elderly care it is a major challenge in most of developed countries. It have adverse impact on health services and economic systems costs. Elderly people becoming more isolated and marginalized either by moving them to home care facility or living alone at home for a long time. Isolation is a major cause of negative impacts on elderly social wellbeing. (Helen & Henry, 2016). To overcome this issue country like Japan and Finland took an approach by developing a promising approach   in project called (METESE) "Meaningful Technology for Seniors joy, comfort and safety" (Fukuda, K et al, 2017).

2.3   Caring science

Its known that technology didn't influence only patient care but also treatment, nursing skills and caring means. Technology try to fit in caring science by working with its ethics s, (the promotion of the human good and health, and alleviation of suffering., Eriksson, 2010).This relation between caring science and technology was brought to consideration by article in International Journal for Human Caring April 1, 2017 "Technology has influenced not only

patient care, caring skills, treatments, but also health policy" (Barnard, 2002; Nordman, & Eriksson, 2014).

2.4   Technology adaptation in elderly

Four among ten American elderly own a smartphone, it has increased to more than doubled compared to study conducted in 2013 by Pew Research center (2017). Though elderly have lower rate of adopting technology, with increased usage of mobile technology has influenced same groups of younger elderly who are highly educated in using different types of technology at rate like that of adult below the age of 65. Internet usage among elderly has also increased from 14% by early 2000 to 67%.

According to Scandinavian Journal of Primary Health Care, (March 2019) in Sweden elderly are considered as large consumers of care. Technology through mobile information has showed a promising result in prevention, intervention and treatment. With development of Electronic health (e-health) and tele health service has shown improvement and promising out comes that help elderly with self-monitoring.

From the article "Having to learn this so late in our lives" also shows that patient quality of life and satisfaction when using telehealth is similar or better than normal usual care. (Nyberg, V.M et al, 2019)

Other studies show when it is difficult for elderly going out and Participate in community activities, information and communication technology (ICT) can be the best alternative to enable elderly to connect and participate in meaningful activities. (Helen Hasana and Henry Lingerb, 2016)

Technology involvement in caring for elderly is to full fill the challenges that we are facing in caring. Technology play part in providing the missing assistance. Nurses pay few visits per day. A good care covers a wide range. An example of a study conducted by (Lexis, M. 2013). Evaluating a home activity monitoring technology (Quite care) for psychogeriatric and frail elderly living alone. Results showed reduce burden of care giver.

According to article by (Helinä Melkäs, 2013) on innovative assistive technology in Finland public elderly care services there are five roles in which Technology can be used in supporting elderly people.

- Technology should provide prevention by designing solutions that aim in preventing weakening of health.

- Support strength: Technology should develop methods and devices that will widely help elderly to benefit during working, social interaction, leisure time and learning.

- Compensates for weaken ability by providing devices, method and devices that compensate the weakened senses or ability.

- Support care work by providing technology that will help and support care worker on their work.

- Technology aiding in Further research while helping elderly indirectly supporting clinical and scientific research.

Technology Advantage

Real time monitoring and automatic reminders help the society to reduce human errors and provide on time care due to availability of real time information on elderly status. This has significantly improved quality of care provided. Technological systems help to understand the patterns of care required; hence a quality satisfactory care will be prioritized. A study conducted by (Helina, 2011). she discussed to whether technology will help to improve elderly care productivity. The study focused on smart homes which involved elderly and care givers, more than 60 assistive devices were distributed in four elderly homes. These devices were Fire guard, safety stool, Drug dispensers, Sensor carpet, smart door guard, wellbeing wrist band, easy to use phone, and other assistive device for hearing, seeing cooking and eating. Result showed that increasing in work facilitation and monitoring, increased of safety and security also increase in independent among elderly.

2.5   Smart technology in care

This chapter describe how technological devices can work together by sharing information in a network. "A smart Technology allow sensors, databases, and wireless access to collaboratively sense, adapt, and provide users within the environment" (IGI Global definition). A constant worrying of increasing number of elderly people especially in developed countries will be a challenge due to lack of care workers. Smart technology is considered as a key element to support independent living. In the article by (Wantabe et al, 2016) discusses on meaningful technology for seniors which involves Robotic technology (RT) and

information communication technology (ICT) as the key elements on supporting elderly independent living.

2.6 Assistive Technology

As defined by WHO "Assistive devices and technologies are those whose primary purpose is to maintain or improve an individual's functioning and independence to facilitate participation and to enhance overall well-being"

In the (Bulletin of the World Health Organization, March 2012), it shows that isolation and restricted mobility don't have to go along with getting old, avoiding this innovative technology plays a crucial part in maintain physical health and older people independence.

In recent years patients have been encouraged by physicians and are increasingly involved in clinical decision making although this can be different in elderly people as described in article (Sarah et al, 2013). Older people don't want to be involved in decision making but they want professionals to consider their wishes and concerns when making decisions.

3 Framework

I this chapter Eriksson Caritative care theory and major concepts are discussed.

A better care is the one which full fill individual needs, in order to work professional better understanding care through caring science. Theory of caritative caring which guide nurses in providing good care, emphasis on theory is ethics which involves caritas, charity and love, these are important in relation with other humans. (Alligood, M. R. 2014, p. 174).

Increase in elderly, increase in life expectancy in most of developed countries has led to shortage of nurses, and a lot of elderly care is needed. In patient settings a nurse is a coordinator and communication director, for this a nurse require diverse skills to deliver optimum care.

3.1 Caritative care theory

The theory of Caritative care by Katie Eriksson ."Caritative care means we take *"caritas" into the use when caring for the human being in the health and suffering ...Caritative caring is a manifestation of love that 'just exist' ... Caring communion, true caring, occurs when the one caring In a spirit of caritas alleviates the suffering of the patient."* (Eriksson, 1992c, pp. 204, 207).

The theory consists of eleven major concepts and definitions. which are discussed below *Caritas*. It is a fundamental motive in caring science, in caring caritas means charity and love that lead to faith and hope through tending. *Caring communion*: It is a structure, context that defines caring reality   with caring communion involves respect, honesty warmth, closeness, tolerance also intensity and vitality. It provides meaning and strength in caring. *The Act of Caring*. It is an art that involves caring elements of hope, faith, playing, learning, tending and love which can turn something less special to special. *Caritative care ethics*: A distinction between nursing ethics and caring ethics it is about relationship between patient and the nurse, on ways in which nurses approach a patient work with patient respecting his or her dignity.

 Dignity: It is one of core elements in caritative care which divide dignity in two groups which are absolute dignity and relative dignity and the difference between them is that absolute dignity is granted during creation while relative is through cultural and external contexts. *Invitation*: A state of genuine hospitality, charity and invitation which makes a patient feel welcomed by caring communion. *Suffering*: Unique isolated experience, sense of getting disconnected from something. A struggle between good and evil. *Suffering related to illness, to care, and to life*: With illness and treatment comes when a person is suffering from illness, and absence of care lead to suffering related to care and being a patient that affect entire life led to suffering related to life.

 The suffering human being: This describe a patient, derived from Latin word patiens which mean suffering. refers to a state of suffer and patiently endures. *Reconciliation*: After human being suffer and given time to suffer and reach reconciliation. Means regarding one self-including other imperfections but seeing meaning and a way forward in one's suffering. *Caring culture*: Characterized by cultural elements like basic values, rituals and traditions. This are important in caring since when respected and followed they create a caring culture.

3.2   Caritative care theory major assumptions

Caritative care theory discuss four major concepts which are, human being, nursing, environment and health.

Human being. According to caritative care theory a human being is an entity of spirit, body and soul. It means when taking care of a human being who is fundamentally holly which refers to human dignity, meaning accepting human obligation, serving with love and exist to serve others. Human being is constantly changing and never in state of full, Human being is fundamentally dependent in communication, dependent on another, defining a human being only for his or her need it is insufficient since there is hope, wishes and desires. (Alligood, M. R. 2014, p. 177 - 178).

Nursing. Caring through ages has been defined as minister and help to those suffering. in Caritative care theory Eriksson caritas motive is where caring gets its deeper meaning, caring is original and natural this implies to unconditional love, cleansing, spontaneous and nourishing. A true caring it is not in the form of behavior or feeling or state it is through expression of charity and love which aim at saving health, life and alleviating suffering. She also distinguishes between caring nursing and Nursing care, Caring nursing it is a kind of care with emphasis to patient suffering and desire. while nursing care is based only nursing care process. (Alligood, M. R. 2014, p. 178).

Environment. Eriksson talks about ethos which mean home or a place where human being feels at home. ethos of caring science and care they involve love, respect, charity, and honor of respect and dignity. She also defines ethos as a symbol of human being inner space where he or she feel comfortable. Ethos is a core of caring culture, reflect on priority of values in which ethics action and ethical appear. (Alligood, M. R. 2014, p. 179).

Health: Wellbeing, freshness and soundness are analyzed in concept of health including health being implying being wholeness in spirit soul and body. Eriksson view health as a movement that depends on vital force and vitality of body, soul and spirit. This movement is determined by human being needs and desire, will to find meaning, life and love as a source of energy towards realization of one's potential. (Alligood, M. R. 2014, p. 179).

4   Aim and problem definition.

The overall aim of the study is to describe the benefit of technology in elderly care. Another aim is to find out if elderly can benefit from using technology. Focus will be on describing the benefit of technology in security, assisting, social support and health support

4.1 Problem definition

How can technology help nurses in providing care in elderly settings?
Can elderly benefit from using technology in their home?

5   Method

This study is conducted as a qualitative research using systematic literature review. Literature reviews are key factors in development of research ideas, and they play a key role in developing evidence-based practice. Authors using literature review, should make sure to write accurate and correct information that will provide the reader with objectives without copying or fabrication. Findings that might be conflicting with personal values should not be omitted neither findings that contradict with other studies. Author should not take any credits for ideas and findings that are not his or hers. Findings should be structured, transparent and replicable in a way that if same one replicates the study findings will end up on similar findings or results. (Polit & Beck, 2010, p 184 - 186).

5.1 Ethical Issues

In nursing when conducting a research there are principles and guides that should be followed to make study findings credible. In conducting literature review there are no need of participants. As a literature reviewer there is no need of collecting confidential and sensitive information. (Suri H, 2020, pg 41). Among of the major ethical issues in literature review are academic fraud, plagiarism and misrepresenting result.

5.2 Data collection

Review were done by collecting evident literature from current primary studies that provides information that corresponds to the topic of study. Inclusion and exclusion criteria were an option to promote more weight on studies with strong correlation to the topics of study. In finding a quality article it involves evaluating its quantitative rating and strength evidence it gives. The evidence from relevant article should aim on describing the use of technology in elderly care. (Polit & Beck, 2010, p 516 - 520)

Data collection was done through searching on databases and other relevant sites. The aim was to make sure that I get enough scientific articles by using a sensitive search criterion that will look at fewer but relevant reference from large reference search. A key phrases "technology", a conjugate "AND" in combination with other key phrase were used to find the right references (e.g. "Technology and elderly", "Technology and care", "Technology and elderly homes", etc.) This helped in retrieving fewer and highly relevant references. In systematic review a meta-analysis is opted since it looks at problem statement and research question. (Polit & Beck, 2010, p 515 – 517, Gerrish & Lacey, 2010, p 290 - 292)

Table 1. Inclusion and exclusion

INCLUSION	EXCLUSION
Article written in English language	Article written in other language
Article relevant to Research question	Irrelevant article to research question
Academic peer reviewed article	Non-academic article.
Articles published 2010- 2019	Article published before 2010
Full text article	Article that are not available in full text

Literature search and reviewing is one of the special skills which a researcher should develop, a lot of wealth literature are available that can answer clinical questions. An approach to a study helps in reviewing. Literature review is carried out by reviewing the past articles and journals by looking at what is working and more efficient, it is a part of research design. (Gerrish & Lacey, 2010, p 75). Literature review is a secondary source, for a new study literature review its important to relay on Primary sources which include research reports. Secondary sources

are study description done by same one other than original researcher. They can be good for providing quick overview, but not substitutes of primary source. (Polit & Beck, 2010, p 171).

After literature search is completed and sorted next stage is writing review. Three key stages as presented by (Gerrish & Lacey, 2010, p 75) are as follows. "Sorting" meaning a critical examination of the retrieved data that involves finding out to whether they meet review criteria and answering research question. Identification of key points, themes and results. It involves clarification of research findings and applying them to study question. Writing up findings, A clear structured approach that will made it possible for anyone to reach exact same results on how the research was conducted.

5.3   Inductive content analysis

The study was conducted in qualitative content analysis approach in inductive way focusing on research question about ways in which technology can help elderly and nurses to increase productivity in elderly care. The focus was on finding literature on benefit of technology on both elderly and nurses. Main idea of inductive content analysis is important to find pattern and similar themes throughout the collected data and then carefully describe them. Data collected from studies are developed into category and themes then summarized to give meaning linked to the research question. Inductive analysis it claimed to provide reasons that support the probable truth found in conclusion. (Crews-Anderson & Mark, 2007, p. 32)

Content analysis is guided by different discipline which each lead to development of ways of addressing interest. It provides flexibility and options to adjustment during data collection. Analyses data by triangulation, motivates data collected from variety scientific sources by provide understanding by using different methods. The goal is to provide a rich understanding to a phenomenon when become available and it is constructed by individuals on owns context (Polit & Beck, 2010, p 259 - 260)

6   Results.

This section of the study aims at providing answers on ways which technology helps nurses to provide care to elderly and how elderly benefit from using technology. Nineteen articles were selected, analyzed and read through multiple times. From the research aim, related key phrase

used in data collection were developed into categories and themes. Key themes Assistive technology, monitoring technology, and social assistive robot.

Table 2 below shows how each theme plays part in elderly care by looking on categories side.

Table 2

Categories	Themes
Maintain cognitive and physical Function Support chronic diseases management Minimizing risk of fall, accidents and getting lost.	Assistive Technology
Enable self-follow up of vital signs. Reduce frequency of hospitalization Reduce need of institutionalization Increase safety and security	Monitoring technology
Reduce cost of health care Support independent living	Social assistive robots

6.1 Assistive technology

In this theme of assistive technology, the following categories were used, maintaining cognitive function, support chronic diseases management and minimizing risk of fall, accidents and get lost. Information and Communication Technology (ICT) development and its usability in health care is to assist and monitoring. Assistive technology is likely to play an important role in caring for elderly people at home and in institutions. Since most of elderly like to be taken care in community which is also less expensive than in elderly care homes, assistive Technology involvement can be beneficial to both care giver and elderly. A long-term challenge of elderly care due to growing population of elderly lead to serious impact towards social welfare systems. ICT and robots can be a solution to this problem. (Watanabe et al, 2017)

Maintain cognitive and physical function

Ageing cause unavoidable reduction in cognitive and physical function. For those with losses in cognitive and physical function they often need special care, assistance and support. Assistive technology is one of important area which can be used to improve old people cognitive capacity and physical function. ICT can be used in restoration and provide improvement on certain function, for example wearable sensors with ability to predict the risk

of fall. this lead to improvement in physical activities and quality of life. (Howcroft et al, 2016). Mobile technology provide programed puzzles and mobile games which increase in semantic memory performance. (Allard et al. 2014).

Support chronic diseases management.

World population is ageing quickly and hence increase in age related diseases. Ageing cause elderly to be dependent and required care all the time from care giver or family members. Among of the chronic diseases that affect elderly above 60 years are diabetes, COPD, dementia and chronic heart failure. Home Telemonitoring is good for supporting patients with long term condition. by remotely monitoring patient clinical symptoms and sign (Middlemass et al, 2017). Technology like Ambient Assistive Living (AAL) help care giver with the use of sensors and actuators to support patient from distant.. (Aloulou et al. 2013)
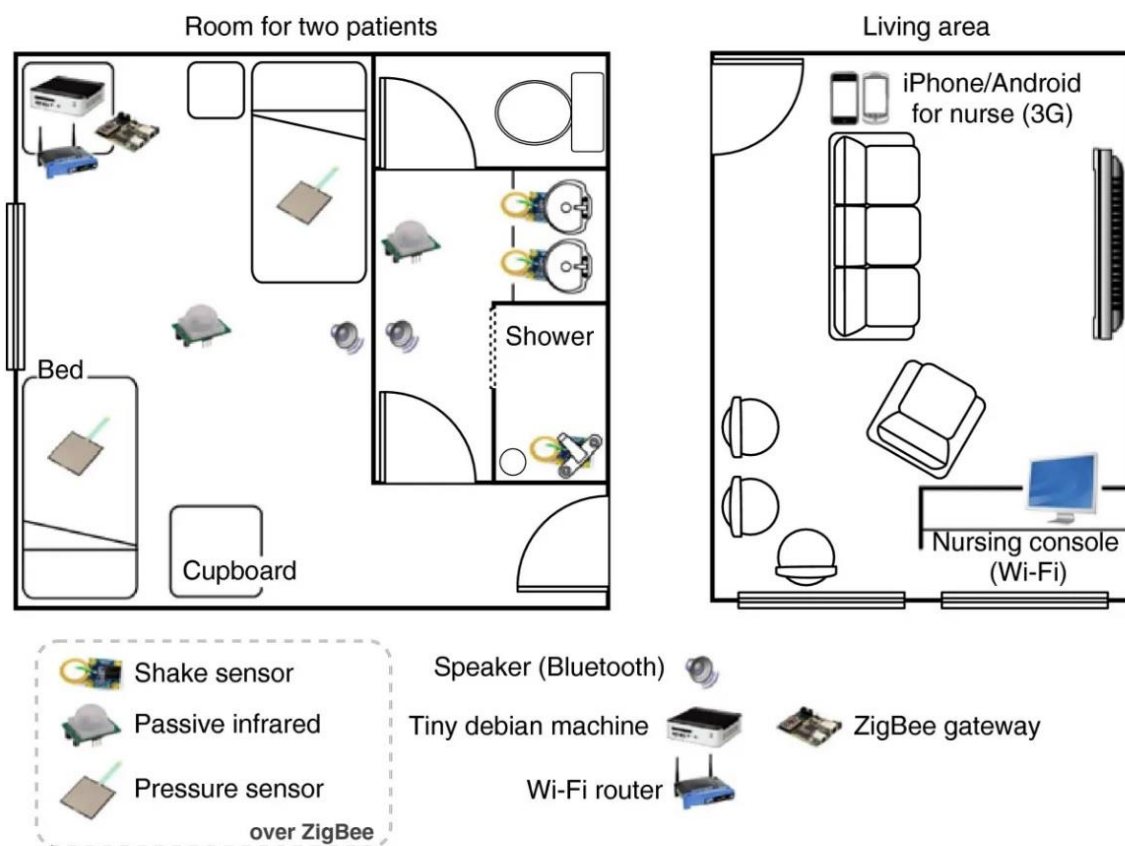
Fig 1. Floor map of the nursing home Deployment (Aloulou et al. 2013 pg. 6.)

Figure 1 above show patient room and living room. Patient room is equipped with shake sensor senses movement of items like shower handle, pressure sense in bed and carpet senses pressure on a given area, used for monitoring position can detects a fallen patient. cameras for monitoring activities, Infrared sensors sense movement can turn light on and off, spiker are used by care giver to broadcast audio message. Zigbee, router and debian machine are used to provide networking. In living area there is mobile phone and console for accessing and entering data.

Minimizing risk of fall, accidents and getting lost

Risk fall assessment is done by health professionals by using different scale that estimate falling risk and even future fall probability. By incorporating assistive devices like sensors provide additional information to falling risk scale. Wearable sensors like accelerometers they can measure movement in three dimensions in respect to mass, gravity and acceleration. Data collected from these sensors can be used for fall risk assessment. Technology like Ambient sensor can be placed indoor and outdoor they allow detection of human presence, actions, movement and even measuring heartrate. (Immonen, M.S. 2019)

6.2 Monitoring Technology.

Monitoring technology is the second theme which had following categories Enable self-follow up of vital signs, reduce frequency of hospitalization, reduce need of institutionalization increase safety and security.

Monitoring technology involve a group of systems that have been developed and implemented in elderly homes to monitor there activity. These systems make use of mobile phones, wearable sensors like GPS and wireless sensors, Tablet and smart Televisions (Sitar-Taut et al,2018). Monitoring Technology is useful tool in promoting independent living in elderly, also it is essential to social and health care sectors. A demographic change in growing number of older people while decreasing in working population smart homes are considered as one of the best solutions for supporting ageing in place for elderly. Smart homes have automated recognition of daily activities through sensors and infrared cameras. (Hong & Nugent, 2011)

Enable self-follow up of vital signs.

In recent years elderly long-term care has become extremely important. In order to oversee, manage and provide elderly needs it's important to integrate physiological monitoring systems. Radio frequency identification (RFID) monitoring technology can be designed according to the needs for elderly which provide a complete medical care. RFID readers get physiological information by means RFID readers and sensors which are then transmitted to terminals so they can be accessed by medical professionals. (Yeong-Lin Lai et al. 2016).

Wearable sensors are devices that can be placed directly or indirectly in human body, their applications can be seen in fitness, assisted living, surveillance healthcare, they provide signals such as electrocardiography (ECG), temperature, electromyography which are accurate and reliable in monitoring elderly activities and behavior. These sensors when integrated into the system the provide high capacity at low cost, less power used, and less weight. They can be placed on belts, sunglasses, clothes, shoes, smartwatches and even inside the body. (Biagetti et al. 2018).

Reduce frequency of hospitalization, reduce need of institutionalization, Increase safety and security.

Use of Healthcare technology has a great promise for enabling elderly to age and monitor their health at home. Technology has an ability to provide care giver with latest information and help in making better care decision and helps in managing medical condition. With internet elderly can self-manage by being connected to health care by using assistive devices and eHealth applications. (Czaja, 2015, Aloulou et al. 2013). Monitoring technology and sensing technology they promote health maintenance and wellness. (Czaja, S.J. 2015)

Figure 2 below show how an intelligent monitoring system using RFID technology. From the data flow diagram Personal information and physiological data will be collected by RFID Readers and RFID application will record and store it into Database servers, from there these data can be accessed in real time by medical staff through internet, wi-Fi including mobile networks. Finally medical staff will diagnose collected data and elderly or patient will be taken care.
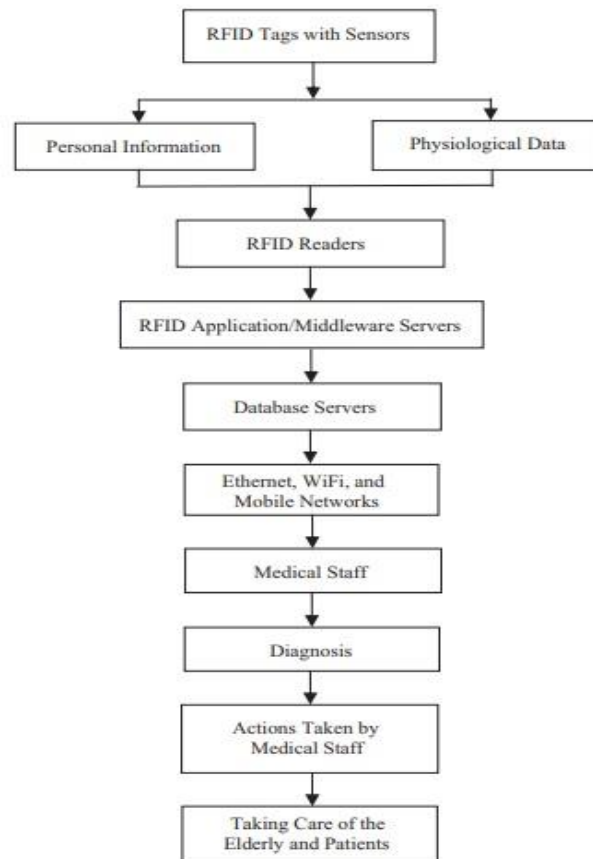
Fig 2. A flow diagram of data from RFID intelligent health monitoring system (Yeong-Lin Lai et al. 2016, page 5).

6.3   Social assistive robots (SAR)

Social assistive robot is the third theme which had two categories reduce cost of health care and support independent living. Social assistive robot interact with elderly through social interaction, in therapy delivery and physical assistance, social assistive robot can help in building skills and social behavior.

Reduce cost of health care

By automating some of caring tasks will promote efficient use of care givers, reduction of staffing costs by using e health application, it will enable reaching more patients with less time and it improve processing time.

As part of ICT and digitalization robot technology will contribute in increasing productivity and efficiency in care by supporting elderly to do self-care by taking more responsibilities.

(Niemelä et al, 2016). Elderly need more support on house related needs adoption of assistive technology will have direct effect on house physical environment and promoting individual functioning which will indirectly improve, social perception, belief and attitude of independent living.

Support independent living

Robots at this context have a potential of supporting independent living by monitoring, help in providing household maintenance, provide social function, mobility and maintaining safety. (Pigin et al, 2012)

Different types of care can be provided by robot either by interreacting with it or by it working on itself. They can be categorized as robot-assisted care meaning assist care giver in providing care and robot-based care which need interaction with health care provider or elderly. (Laitinen et al. 2019)
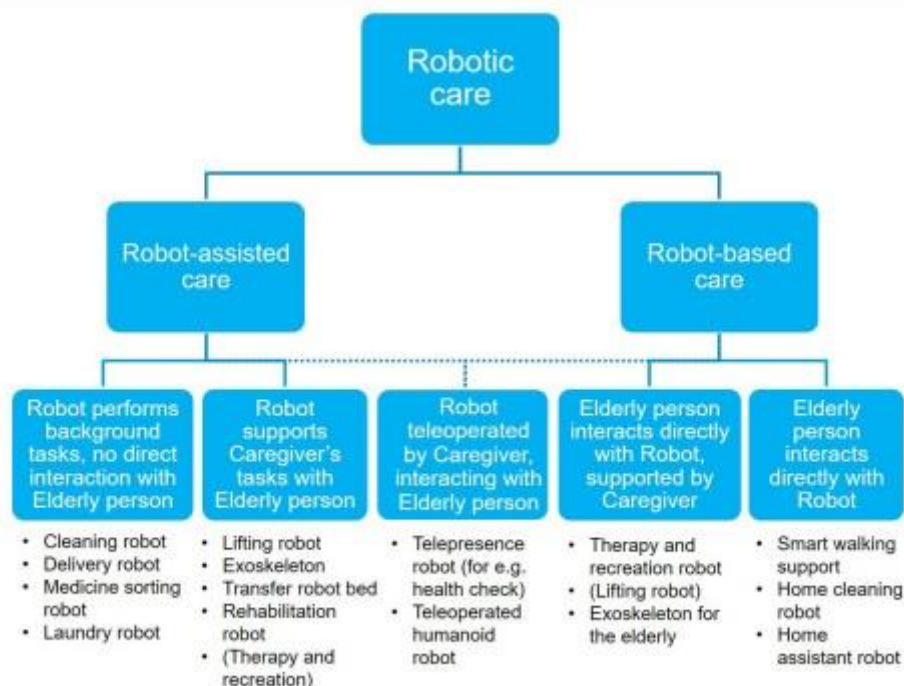

Figure 2. Categories of robotic care.

Fig.3 shows Three kinds of robotic care. (Laitinen et al. 2019, pg 371)

Figure 3 above shows ways in which robot can be used in care which are categorized in two section which are robot assisted care and robot-based care. Robot assisted care assist and robot-based care need to be interacted.

7   Discussion.

In this chapter of discussion two categories are found which are result discussion and method discussion

7.1   Result discussion

Increase in ageing population cause demographic shift between care giver and elderly. Shortage of care giver raises a concern on ways to support independent living and selfcare of elderly. With advancing technology and its usage in health care were the factor that lead the writer to conduct this study.

A major reform and focus of elderly people clinical care is required to bridge the gap between demand and supply of care. A technological development in ICT and robotics is considered as an effective solution towards development of elderly care services. (Watanabe et al. 2017). According to Caritative care theory "human being" is body, spirit and soul that means care require more caring responsibilities.

With information gathered from articles shows a growing number of elderly people population, and our society is faced with challenge of organize various form of care. Ageing come with different challenges like dementia, chronical diseases, disability, decline in cognitive function, depression, loneliness, and social isolation. Formal and informal care is required as shown by statistics in article by (Mali & Grebenc, 2019). Katie Eriksson describe care in her theory as compassion that awakens desire to alleviate another's suffering.

In European union the proportion of aging people is about to increase to 28.1% for age 65 years and those above 85 years will double to 57.3 million by year 2050 and the available work force will not be enough. In order to overcome this problem technology plays an important role by showing promising results. In caritative care theory suffering is one of the facts which nurse must recognize. In Finland and Japan they have developed a project called "Meaningful Technology for Seniors" (METESE). Robotics and Information Communication Technology (ICT) plays a major role in preventing factional decline, maintaining physical function and enabling people with disability. (Fukuda et al. 2017).

Technology by means of digitalization and ICT are major reforms to how health and social welfare will be arranged to full fill caring needs at manageable costs. This will increase efficacy and productivity in care by enabling elderly to take more responsibility of self-care. (Niemelä et al. 2016). example a home telecare which provide information to health professionals without them visiting the patient. In Finland the elderly population is expected to reach 25.6% by year 2030 the dependency ratio will be by 70%. Finnish government went further by making governmental statement on intelligent robotics and automation ("Valtioneuvoston periaatepäätös älykäästä robotiikasts ja automaatiosta" 2016) (Valtioneuvoston yleisistunto .2016). it is because automation and intelligent robotic offer opportunity in addressing challenges in the society. Primarily Robotics application to be used in Social and health care.

Technology has facilitated good quality nursing care by providing variety of products and services which empower elderly to maintain self-care. With this transition health care cost will be reduced significantly and enable old people to live independently (Agree & Freedman, 2011). Quality of life and independence which comprises of joy, happiness, pleasure, family and sense of community can be done by assisted humanoid robot which could talk and play games with elderly. (Miwa et al, 2017)

Technology offer great solution to increasing elderly population, but also brought concern on elderly people level readiness shifting from human assistance to technology assistance which might lead to reduced human contact. Literature reviewed by (Kachouie et al. 2014). showed a great concern on loneliness and privacy since technological product services make use of video cameras and sensors. According to (Van Der Heide et. al, 2012). With time experience and awareness will help older people to be more engaged into technological services. With regular update, reviewing of technological services and provide solution will improve elderly perception on the use of technology. (Agree & Freedman, 2011). I order for technology to be accepted depends on good design and user friendly for both care workers and elderly. Training, maintenance and support improves the acceptance of technology. (Niemelä & Watanabe, 2018).

From the METESE project which was developed by union between Finland and Japan the project aimed at understanding challenges and possibilities of integrating robotics and ICT technology in elderly care. Technology is seen as immature and expensive and take more effort and time than what it gives back, including mindset that care is to be done by human. With

increasing number of elderly people and lack of care giver technology can be one of the best options to provide solution, since its able to support independent living of elderly people in different ways. Training enables integration of technology in care since it provide formal and informal education to elderly and care giver. This can also be noted in caritative care theory when describing caring communion. To improve user willingness to adopt technology and make use of it for long time a close support, training and regular solution are required. In order to archive integration and adoption of technology changing of mind set is the most important. (Niemelä & Watanabe, 2018, pp 17-18).

7.2   Method Discussion

The study was done by collecting data from databases like EBSCO, PubMed and CINAHL, study was conducted in inductive content analysis. Key word like "elderly and technology", "Technology and care" and "nursing and technology" were used. Inclusion and exclusion criteria were used, Systematic literature review method was used to find information from scientific article. Author aim was the use of technology to improve productivity in elderly care. nineteen articles were analyzed that describe oh how technology enables elderly and health care professional in caring. The results from this study shows that technology is one of the promising fields that provide solution in elderly care by enabling elderly to live independently and facilitates healthcare professional better use of time at reduced work overload. Author answered the research question in categories and themes to show how technology plays a part in each section. Reviewed articles provided enough information and results to make this study useful for future research.

 Reviewed articles had also negative outcomes or questions on adoption of technology in elderly care since it may lead to loneliness, being expensive, it takes time to develop. elderly willingness and mind set. Articles also showed these negative outcomes can easily be solved by regular updates, training to both elderly and healthcare professional and change of mindset.

8   Conclusion

Not only the number of elderlies is increased day after day, also more and more elderly live alone. Increase in life expectancy, evolution of family structure and more divorces and single families means more people living alone when they age. This demographic and economic

change affect the healthcare system. A proper allocation of financial resource and manpower for quality care service its important. Technology is one of the most promising option.

Technology provide benefit to health care professionals and elderly. For health care professionals implementing assistive technology it reduces overload of work and prevent burnout. Enables organized, structured and better flow of work, allow better use of time which result in minimized medical mistakes. Assistive technology enables and motivates health care professional to provide good organized advanced care which satisfies elderly.
Elderly benefit from technology since it reduces the need of institutional care also it facilitates safe and independent living at home. Technology using ICT provide quality of life increase wellbeing and reduce depression.

The result from this study show that technology has promising outcomes towards elderly care, and it support elderly ageing at home. Elderly needs are key factors that caregiver should put emphasis on when it comes to promoting elderly care. Results from studies come from both nurses and elderly experiences on using technology. Although same studies on technology use in elderly care showed positive outcome and other negative, this study is focusing on understanding how technological care can play part in a relationship between elderly care and nurse or caregiver. For better understanding of care Katie Eriksson caritative care theory was used as help to and guide on implementation of technology in elderly care by considering the Caritas which are love that just exist, caring communion and true caring. Caritas motive is to provide discipline in caring science. Theory help in guiding to maintain discipline when using technology in elderly care. Technology used must be user friendly, tending, playful, respect dignity and it should tend to care in need. Results from studies were linked to each other in order to make a connection and common understanding between care required and technology. Technology should be able to provide required care and full fill patient needs. Most important aspect was understanding elderly needs and provide solution. Technology in elderly care is still a new thing and it is strongly recommended for future research, especially when population of elderly is growing and less manpower to provide care. Authors opinions on change of mind set and training on technological care should be acknowledge more in community.

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Appendix 1

Author/ Tittle	Country	Year	Purpose	Data collection/ Method	Result
Allart et al Mobile Technologies in the Early Detection of Cognitive Decline	UK		Identification of biological and pathophysiological processes implicated in different forms of dementia	60 elderly were selected randomly and above 65 years. Interview was used.	Mobile technology provide more reliable descriptions of early cognitive difficulties that are inaccessible to clinic or hospital-based instruments
Sitar-Taut et al Smart homes for older people involved in rehabilitation activities – reality or dream, acceptance or rejection?	ROMANIA	2018	Evaluate degree of acceptance/implementation of different technologies in Romania, of monitoring in the rehabilitation activity conducted at home	Study comprised 154 persons with a mean age of 73.37 ± 7.33 years, of which 64 (41.6%) male and 90 (58.4%) female. All subjects completed a questionnaire regarding the living conditions and health status	71.9 % patients agreed to wear a portable sensor33.1% accepted videocam, 47.4% accepted a screen, 41.3% accepted living room monitoring, 68% sensor in the room on the wall and 69.1% accepted fall detection sensor.
Howcoft et al Wearable-Sensor-BasedClassification Models of Faller Status in Older Adults	CANADA	2016	Predicting fall risk earlier interventions and fall risk reduction	A sample of 100 people, 65 years or older, were recruited from the community and Interviewed	This investigation predicted retrospective fall occurrence with varying degrees of accuracy, sensitivity, and specificity
Czaja, Can Technology Empower Older Adults to Manage Their Health?	USA	2015	Healthcare technology applications hold great promise for allowing older adults to manage their health and age at home.	Partnership model, consumers are expected to assume more responsibility in managing their health and play a more significant role in their care.	Healthcare technologies hold much promise for meeting the needs of increasing older population offer many potential benefits for older adults
Aloulou et al Deployment of assistive living technology in a nursing home environment	SINGAPORE	2013	. A technical ambient assistive living solution, consisting of a set of sensors and devices controlled by a software platform, was	14 months experiment, three rooms in a nursing home with the participation of eight dementia patients and two caregivers	data analysis demonstrates the ability to provide early detection of the degradation of patients' conditions

			deployed in the nursing home		
Hong &Nungent Implementing evidential activity recognition in sensorised homes	UK	2011	Automated recognition of activities of daily living	Experiment of 28 days with worth of sensor data which was recorded from a single person living in an apartment.	The results achieved have been promising and provide further evidence that the approach is applicable to a real living environment.
Yeong-Lin lai et al An intelligent health monitoring system using radio-frequency identification technology	TAIWAN	2016	Different physiological monitoring systems to be integrated on the same interface to help oversee and manage the elderly's needs	The system provided the health monitoring functions of the physiological biosignals, such as SpO2, blood pressure, blood sugar, ECG readings, body temperature, and respiration rate (Experiment and interview)	The intelligent RFID health monitoring system demonstrated efficient capabilities for the elderly and patient
Biagetti et al Human activity monitoring system based on wearable sEMG and accelerometer wireless sensor nodes.	SPAIN	2017	Monitoring technology for ambient assisted living, surveillance-based security, sport and fitness activities, healthcare of elderly people	Interview of three subjects involved in the experiment were all volunteers who gave their written informed consent in participating in the experiment after having been instructed on the tasks to be performed.	The signals acquired was combined and processed in order to detect, monitor and recognize human activities
Van der heide et al Implementation of CareTV in care for the elderly: The effects on feelings of loneliness and safety and future challenges	NETHERLANDS	2012	Investigate whether CareTV is a valid instrument for elderly to engage in meaningful social contacts by a video connection to avoid loneliness in formal caregivers	Questionnaire to 180 clients of homecare organization Proteion Thuis were connected to CareTV. 130 clients with the average age of 73.2 years were included in the study	The research shows CareTV can soften feelings of missing a good friend or partner and can partly enrich an essential part of the general social network
Helin¨a Melkas Innovative assistive technology in Finnish public elderly-care services: A focus on productivity	FINLAND	2012	The study investigates ways in which technology use may help municipalities improve productivity in elderlycare services. A case study of Finnish elderly-care services provides responses concerning impacts, decisions and options in technology use.	Over 60 assistive devices were introduced in the smart homes used during short-term housing periods. Interview was used to collect information	Assistive device-related operational processes were investigated with the help of concepts of 'resource focus', 'lostmotion' and 'intermediate storage'. Four central operational processes were identified.

McCaskey et al Enabling Intensive Motor Cognitive Rehabilitation Exercises in Geriatrics Using Information Technology Solutions	SWITZELA ND	2 0 1 8	Finding new ways to make exercise more accessible and acceptable for older adults	observing patterns of ageing in western societies, attention towards healthy ageing as a means to preventing decline in functioning	ICT for active ageingmainly iiiocused on aspects of usability and user experience, the current status of IT as Applied in ageing populations noticeably shifted toward new services
Niemelä et al Expectations and experiences of adopting robots in elderly care in Finland	FINLAND	2 0 1 6	This study explores the process and criteria of adopting robots in elderly care in Finland	Interview data from two decision-makers with the perspective of caregivers who have experience of taking a robot (Paro) into use in their daily care work.	The results indicate that the interest in care robots is shared by decision-makers and care workers, but their expectations of suitable applications may vary
Laitinen et al Demands of Dignity in Robotic Care: Recognizing Vulnerability, Agency, and Subjectivity in Robot-based, Robot-assisted, and Teleoperated Elderly Care	FINLAND	2 0 1 9	The article examines how robot-based, robot-assisted, and teleoperated care can amount to realizations of dignity	Research done to three kinds of robotic care, therapy robot seal Paro5, the robot dog Aibo6, a telepresence robot and a robot walking support	robot-based care, robot assisted care, and teleoperated care can each contribute to realizations of human dignity both positively and negatively, and it will expectably depend on the institutional and cultural settings
Pigin et al Service robots in elderly care at home: Users' needs and perceptions as a basis for concept development	GERMANY ITALY SPAIN	2 0 1 2	"Multi-Role Shadow Robotic System for Independent Living" (SRS), aiming to generate user requirements and realistic usage scenarios maximizing the alignment with users' needs, perceptions, feelings and rights	A qualitative and quantitative research – based on focus groups (59 participants) and questionnaires (129 respondents) – was carried out in three countries: Italy, Spain and Germany.	A tele-operated robotic system may be of help for frail elderly people. In certain cases this solution may be effective only in conjunction with a 24-hour professional Service Centre able to manage tele-operation when relatives are not available
Watanabe et al. Analytical Framework for Elderly-Care Service Systems	AUSTRIA	2 0 1 7	framework to evaluate the impact of technologies in the elderly-care service systems	Subjective preferences of seven stakeholders in the service systems are considered as evaluation criteria in the framework (Interview was used)	innovation and sustainability service systems to implement technologies for elderly-care in harmony with the requirements of stakeholders
Mali & Grebenc Rapid Assessment of Needs and Services in Long-Term Care.	SLOVENI A	2 0 1 8	investigate the needs of older people and the possible responses to their needs. By using the method of rapid	Study was conducted in the area of the Municipality of Straža in October and November 2017 and involved a mixed-method	The portion of the population that are younger than 65 has been getting smaller and smaller, as well as the overall population dwindling in number. This will affect the workload of younger generations when the older population gets large and needs to be cared for.

			assessment of needs and services	approach combining qualitative and quantitative data collection.	
Fukuda et al Study on communication support for employees with ICT in elderly care	AUSTRIA	2 0 1 7	Analysis of elderly care from the service system perspective	Meaningful Technology for Seniors: Safety, Comfort and Joy (METESE) - Models of Digital and Human Networks,"	Results suggest that using a SNS like system to share task-oriented handover was accepted by the employee community successfully
Agree &Freedman A Quality-of-Life Scale for Assistive Technology:	USA	2 0 1 1	develop a parsimonious indicator that can be used in population-based surveys to represent the effect of assistive technologies on quality of life for older people, separate from personal assistance	Using a computer-assisted telephone instrument, trained interviewers completed 360 interviews with a racially diverse sample of adults who were 50 years of age or older and were living in the community	The use of devices to assist with daily activities is an essential component of successful interventions, particularly for older people, who respond more slowly to exercise
Miwa et al Comparison of Japanese and Finnish Attitude Regarding Technology Use in Nursing-care Service	AUSTRIA	2 0 1 7	To support and sustain the elderly nursing-care services, use of new technologies such as robotic devices and IT-based system	Conducted inquiry surveys to find attitude gaps between 219 Japanese and 115 Finnish elderly people	Finnish active seniors wanted to live in their homes with home care services and technologies more than their Japanese counterparts.