A systematic review on the effect of hospital elder life programme in the incidences of delirium among elderly patients in the acute hospital.

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Abstract

Background: Delirium is a major complication in hospitalized older persons that could result in death, cognitive decline, increased length of stay and hospital cost. In most cases, delirium can be prevented from occurring if the risk factors are identified in time. HELP is a delirium prevention program targeted at reducing the rate of delirium in hospitalized elder patients.

Objective: To determine the effect of hospital elder life program (HELP) as an intervention in the incidences of delirium among elderly patients in the acute hospital.

Methods: A systematic review of HELP studies of Cochrane library, Cochrane handbook of systematic reviews, PsycINFO, PubMed, CINAHL, Medline, Communication Search, Google Scholar, and Embase using the step to step guideline of the Cochrane Handbook for Systematic Reviews of Interventions, PRISMA and controlled phrase/keywords combinations.

Result: Of the 6 included studies 5 primary outcome were on the effectiveness of HELP in the reduction of delirium rates in the acute hospital, 3 of which were on post-operative delirium. 1 had the effectiveness in the reduction of delirium rates as a secondary outcome. Secondary outcomes in this SR were the effect of HELP on LOS and cost. One of the studies had an EBL checklist score of 70.8%. 5 of the included studies showed that HELP is effective in the reduction of delirium incidences in the acute hospital. However, one study had no result reported.

Conclusion: Implementing hospital elder life program in the acute hospital could be effective in reducing delirium rates thereby reducing LOS and cost.

Introduction/Background

There is a surge in life expectancy, which has led to the global rise of older adults (Zachary et al, 2020). Stribijo et al, (2013) stated that the percentage of people 65 years and older would account for about 25% of Dutch population in 30 years. Also, in the USA individuals 65 and older will comprise 20% of the population by 2030, and globally one in every eight persons will be age 65 or above (National institute on aging, 2017). In Ireland by 2041, the number of persons 65 and above will be at around 1.4 million which is three times larger than the current number of the elderly. Presently in Ireland, older persons accounts for 11.6% of the population, which will be up to about 22% in 2041 (Central Statistics Office, 2012a; Central Statistics Office, 2007). Generally, old age is a high predisposing factor to hospital admission, more than 48% of patients admitted in the hospital are 65 and over (Central Agency for Statistics, 2008; Zachary et al, 2020).

Delirium is one of the major complications of hospital stay among elderly patients with an incidence figure of about 14% to 56% in the acute hospital (Kartz et al, 2015). It occurs in about 50% of hospitalised aged patients and may prove very fatal as it may to lead mortality (38%, when compared to other elderly patient without delirium 27.5%), increase in length of hospital stay (LOS), may also precipitate nurses burn out due to an increase in workloads, may result in the elderly patient being transferred to a nursing home, and a raise in hospital cost (Witlox et al, 2010; Inouye et al, 2014; Kartz et al, 2015). Furthermore, delirium may occur due to an infection, dehydration, social isolation, malnutrition, anaemia and cholinergic activity changes due to the undue effect of sedation and anaesthesia post-operatively (Young& Inouye 2007; Cavallari et al, 2015; Inouye et al, 2014; Silverstein, 2014; Scholz et al, 2016).

Delirium leads to an increase in the amount of care needed, hospital cost, LOS, and the risk of being discharged to a nursing home (Fick & Foreman,2000). However, about 30-40% of hospital acquired delirium are preventable with the use of effective preventive program (Siddiqi et al, 2006). In the late 1990s, Inouye developed a detailed concept called The Hospital Elder Life Program (HELP) for the prevention of delirium among older patients in the acute hospital (Singler& Thomas, 2017). HELP is an imitable care bundle designed for the prevention of delirium and functional decline of elderly patients admitted to the acute hospital (Inouye et al, 1999; Inouye et al, 2000).

The implementation of HELP entails the use of trained volunteers and highly skilled multidisciplinary staff such as the elder life nurse specialist and geriatrician. Furthermore, all the different multiple disciplinary team (MDT) have various important roles to play (Inouye et al, 2006). The MDT ensures that the intervention protocol of HELP is geared towards the 6 identified risk factors of delirium in the elderly (Inouye et al, 2003). The 6 risk factors of delirium are vision and hearing optimization, sleep enhancement, orientation, early mobilization, oral volume repletion and therapeutics activities (Inouye

et al, 2006). HELP involves an enrolment procedure that uses its stipulated criteria, HELP assessment screening tools, and age 65 and above. This is followed by the intervention protocols which includes daily visitation/orientation, vision, hearing, feeding assistance, sleep enhancement, early mobilization, therapeutics activities (Inouye et al, 2006).

The concept of HELP has been trailed and implemented in about 200 acute settings worldwide and has claimed to be highly successful for its medical and economic benefits (Singler& Thomas, 2017). However, the effectiveness of the intervention has been linked to completeness and adherence to the intervention (Leslie et al, 2005). Nevertheless, study has shown that HELP implementation may be affected by low support received from staff or/ and institutions, poor maintenance of program fidelity, integration of existing geriatric program, and limited resources (Bradley et al, 2004). This systematic review (SR), will determine the effect of HELP as an intervention in the incidences of delirium among elderly patients in the acute hospital.

Design Method

This systematic review was carried using the step to step guideline of the Cochrane Handbook for Systematic Reviews of Interventions, the Journal of Clinical Nursing guideline for systematic reviews and complied to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) recommendation statement (Moher et al, 2009; Higgins & Green 2011).

Aim

The aim of this systematic review is to determine the effect of the hospital elder life program (HELP) as an intervention in the incidences of delirium among elderly patients in the acute hospital. The question for the SR was formulated using PICO (Table 1).

Table 1: PICO

P (Population)	Elderly patients
I (Intervention)	HELP (Hospital Elder Life Program)
C (Comparison)	Usual hospital care
O (Outcome)	Incidences of Delirium
Outcome Measured	The primary outcome measured is the incidence of delirium and the secondary outcomes are LOS and cost reduction

Inclusion Criteria

Research papers on the effect of HELP in delirium among elderly patients who were admitted in the acute hospital were eligible for inclusion. Also, studies from various specialist area of the acute hospital, clustered randomised control trials, step-wedge, cross sectional studies, open study, pre and post-test studies were included. Case studies, systematic reviews, case report and case series were excluded.

Type of Participants

Patients 65 and above, admitted in the acute hospital without dementia and ongoing delirium.

Type of Intervention

Studies focusing on the effect of HELP on delirium, HELP studies with little modification to suit hospital or country policies were also included. Other delirium intervention programmes were excluded.

Type of Comparison

Aged patients who benefited from HELP were compared against other elderly patients who received the usual hospital care without HELP intervention. Table 5 shows the details of studies that were excluded with the reason as to why the studies were excluded.

Search Strategy

Eligible studies were searched for using the set down guidelines of PRISMA, key terms, preselected digital sources and set criteria for the review of study materials. Studies were searched for using digital search engines and databases (Cochrane library, Cochrane handbook of systematic reviews, PsycINFO, PubMed, CINAHL, Medline, Communication Search, Google Scholar, and Embase), www.hospitalelderlifeprogram.org and

endnote for reference list. Medical subject headings (MeSH), Boolean/phrase, (and /or) was considered and jointly used in the search, key search terms (table 2). Limitation was applied to restrict age of patients to ≥65 years, area of care was limited to acute settings as non-acute areas were excluded. The Results of each database searches were reported in a PRISMA flow chart (see appendix I) and fig 1 for an overall PRISMA flow chart. The same studies were found across all searched databases and a permission was gotten from HELP website to use materials; correspondence could be found in appendix (II).

Table 2: Key Search Terms

Hospital Elder Life Program (HELP)
Prevention
Preventing
Acute hospital

Acute care setting
Elderly
Aged
Older
Delirium
Acute confusion
Cognitive impairment
Predisposing factor
Risk factor

Data Extraction

Data for this study was extracted by 2 independent reviewers on the incidences of delirium as a primary outcome, LOS and cost as secondary outcomes. Data extracted were retrieved from included studies and were analysed individual with the following headings: Author and year, tittle, aims and objectives, country, design, sample size, care setting, study duration, intervention, analysis, secondary outcome , primary outcome, results, conclusion and EBL score (Table 3&4).

Results

Description of studies

As shown by the PRISMA flowchart in figure 1, the search results identified 97 studies likely for inclusion. On the exclusion of duplicated studies, 7 studies were eliminated, and 90 articles remained. After critical review of the 90 studies abstracts, 80 studies were further excluded with reasons such as failure to meet inclusion criteria, or the use of secondary methodology. 10 full text studies were reviewed and 4 of those articles were excluded. Finally, 6 articles appeared to have met the inclusion criteria were considered fit to be included for the study. The included studies abstract was included to this work and can be seen in appendix (III)

Excluded Studies

The articles assessed for the SR were sourced using keywords, Boolean phrase on databases, a detailed description can be seen on the PRISMA flowchart in figure 1. On exclusion of 4 papers which were classified not eligible with reasons. Studies excluded with reasons for exclusion can be seen in table 5 and appendix IV for abstracts of excluded studies. The reviewer however deemed 6 of the research papers eligible for inclusion in the study.

Table 5: Excluded Studies

Study	Reason for exclusion
Singler &Thomas, (2017)	Original study not available in English

Zachary *et al*, (2020)	The study assessed the impact of HELP in readmission rate, which does not meet the primary outcome for the SR.
Helm *et al*, (2017)	The article focused on the problem in the pragmatic execution of HELP in the prevention of delirium
Chong *et al*, (2011)	The study assessed patients with delirium in a geriatric monitoring unit. Which does not meet the stated inclusion criteria and primary outcome.

Included Studies

Of the 6 studies included in the SR, 2 out of the studies were randomised controlled trials, 1 cross sectional survey, 1 longitudinal study, 1 prospective intervention study and 1step wedge study. 2 of the 6 studies were performed in the United states of America (USA)and Canada, one in Taiwan, one in China, one in Netherlands and one in Germany. All 6 studies were conducted in the acute hospital, which studied the effect of HELP as an intervention in delirium incidence, cost reduction and length of stay among elderly patients. All patients included in the study were 65 and above, informed consent was obtained in most, one study was unclear if informed consents were obtained.

Prospective Intervention

Kratz et al (2015) performed an open study that assessed the rate of post-operative delirium in 239 patients 70 and above. A prevalence study was done for 6 months after which an intervention phase that took 10 months was conducted. Furthermore, of the 239 participants, n-125 partook in the prevalence phase and n=114 patients were the intervention cohort. During the intervention phase, n-53 belonged to the control group and received no HELP intervention while n-61 participants received an intervention. The primary outcome for the intervention phase was to compare the rate of delirium after carrying

out HELP protocol with the control group. Overall, there was a significant difference in the rate of delirium between the intervention and control group.

Cross Sectional Study

An observational study was carried out by Inuoye et al (2006) in 13 HELP sites which enrolled 11,344 patients. The primary outcome of the study is HELP adaption across all sites and a secondary outcome of delirium incidences measured in all the various sites. The study was conducted within 6 months and data for this study was gotten via survey monkey. However, on an average HELP sites enrolled patients 2 years prior to the survey. Various outcomes by all HELP sites, however 11 of the sites reported that HELP was advantageous in improving delirium rates.

Randomised Control Trial

Wang et al, (2019) conducted an RCT on 281 patients for a year. n=152 of the participant belonged to the t-HELP intervention group, these group of patients were assessed within 24 hours of admission for predisposing factors of delirium, while n=129 of patients were enrolled into the control group. The intervention group were furnished with daily HELP protocol from day 1 to 7/ discharge post-operatively. HELP protocols provided to the intervention group were tracked daily while participant in the control group received regular care and treatment provided in the unit. The main outcome of the study was the incidence of post-operative delirium. Additional outcome measured was the length of stay in the hospital.

Also, Chen et al (2017), carried out a clustered randomised control trial on 377 patients. Intervention group consisted n=197, participants in this group received 3 core mHELP nursing protocols coupled with usual nursing care from arrival to the inpatient unit up until discharge. The study primarily measured the change in delirium rate response to HELP and measured the effectiveness of HELP on length of stay as another outcome.

Longitudinal study

Rubin et al, (2006) conducted a pre-test and post-test quality improvement study on one thousand eight hundred and twenty-five patient 70 and above admitted in an acute hospital over

3.5 years. A pre-test retrospective study of patient's medical charts was conducted to measure patients' baseline of delirium rate through proxy with the goal of reducing the rate of delirium incidences. The charts of these patients were reviewed by geriatricians who has attended to them. The other cohort of patients admitted for HELP and were directly observed. Both groups were similar in their diagnosis group but were about 4.6 years older than the other group. Schizophrenic patients and patients on major tranquiliser medications were excluded from the study. The rate of delirium after

the intervention was the major outcome for the study. Other outcomes reported were LOS and financial outcome. Overall, there was a reduction rate in delirium after the introduction of the intervention, reduced length of stay which translated into reduced financial cost.

Stepped Wedged

Strijbos et al,2013 conducted a multi baseline study to evaluate the "effectiveness of HELP in Dutch health care system" and measured the incidences of delirium. The study was done for 18 months in eight units in 2 hospitals, cohort of patients enrolled were 70 and over, eligible participants are recruited within the first 24 hours of admission into the hospital and are assessed for delirium predisposing factors. The total number of patients enrolled for the study was n=1,081.

Methodological quality of studies included

Quality appraisal and validity check was carried out with an EBL checklist (Glynn 2006) on the 6 articles included in this study. An EBL tool was used because the included studies were not uniform in their designs (see appendix V). To reduce the risk of bias during the review by the reviewer, a second reviewer was used (Halcomb and Fernandez 2015). Bias can be defined as the overestimation or under-estimation of an intervention due to deviation from the truth or systematic error (Bourton et al,2019). All articles included in this study was analysed for risk of selection bias, also the sampling process for all studies included was analysed critically.

Selection bias is the systematically removal of a group characteristic data which could in turn influence the result and statistical significance of the study (Zhang et al 2019).

The methodology design and data collection process of each studies were critically assessed and appraised for risk of bias. Also, the validity of all studies was critically analysed. Validity is defined as the length at which a conclusion, concept or measurement is likely to be accurate and corresponds with the real world (Brain& Manheim 2011). The result presentation of each study was reviewed critically by the reviewer, the outcome of all included study was assessed for outcome bias. Also, not correctly reporting the result of a study could lead to outcome bias. This sometimes could be the less reporting of a negative result or the reporting of only positive results of a study. Generally, the validity of a finding could be affected by bias in reporting methodological design and outcome (Parahoo 2014).

All 6 studies were included in the critically analysis using the EBL checklist. Rubin et al (2006) scored an overall validity point of 91.6%. In this study, it was unclear if informed consent was obtained from patients whose data were represented in the study to measure delirium rate and suggestions for further research was not included in the study. Consent ensures the sole willingly of an individual to decide to partake in a study (Aita & Richer,2005).However, data for the study was

determined with the use of proxy measurement of administrative data and ethical approval was obtained from the hospital ethics committee.

Also, proxy data on the use of physical and chemical restraint was blinded during HELP intervention as staff members were not aware data were being measured and analysed. All confounding values were accounted for in the study, method of data collections and exclusion criteria were clearly stated (Schizophrenia diagnosis and the baseline use of tranquilizers). Additionally, Inouye et al (2006), had a total EBL validity score of 95%. In this study there was no detail of ethical approval. While the authors were not directly involved in patient delivery of care in any of the 13 HELP sites, 1 of the co-author is the innovator of HELP and was involved in the study design, data analysis, data interpretation and data acquisition which could be a conflict of interest and lead to the risk of outcome reporting bias. This study reported a 100% reduction in delirium rate across HELP sites.

Wang et al, (2019) had an overall EBL score of 100%, this result was also validated by an independent second reviewer. This study appeared to have been carried out adhering to majority of the laid down guidelines. In this study inclusion and exclusion criteria were clearly stated, participants were randomly admitted into the intervention and control group. Further, those involved in the data analysis and reporting of outcome were blinded. However, participants and staff members in the intervention group were aware of the ongoing intervention due to the nature of the intervention. Baseline characteristics for both groups were presented in detail and were statically similar. Methods in which the final sample size of 281 was determined was accounted for, both primary, secondary outcomes were stated, and confounding variables were accounted for in this study. The risk of outcome bias was noted as 1 of the co-author's is the creator of HELP.

Additionally, Chen et al, (2017) had an overall EBL validity of 96.2%. The total study population of 377 was not adequate for the measurement of delirium among surgical sub-group and 9 missing participants of the 377 were not accounted for in the study. Also, participants in this study were randomly selected, however both groups received care from the same nurses and MDT which could lead to cross contamination of HELP effect thereby affecting the result reported. Furthermore, participants in this study were only men which could be classified as gender bias in research (Holdcroft,2007). Gender bias in research hold a potential risk for reporting bias as result of 1 sex may be generalized in both sex (Holdcroft,2007).

Kratz et al, (2015) had an EBL validity score of 92%. In this study the population was not large enough as only 65 participants partook in HELP intervention. Also, the number of participants in the intervention group was too little for the statistical analysis of each HELP protocols on the extent the various protocols could prevent post-operative delirium and this could result to reporting of an

inaccurate result (Lo- Biondo Wood& Haber, 2014). Strijbos et al (2013) had an overall validity score of 70.8%, which makes this study invalid. Results of this study was not published by the researcher, and it is unclear if those involved in the study partook in providing care directly to the participants.

Data Analysis

All the included articles conducted a study on the effect of HELP on delirium incidences among early patients and all studies were conducted in the acute hospital. Due to the different designs of the studies included in this paper, the data extracted from all included studies will be analysed using a narrative analysis. Also, due to the lack of homogeneity on the RCTs included in the study a meta-analysis cannot be done.

Primary Outcome

The primary outcome of this study is the incidences of delirium in elderly patient after/ during HELP intervention in the acute hospital. All 6 papers studied the incidences of delirium/ delirium rates. However, 3 studies conducted their study on post-operative delirium rates after HELP, 1 of the study was a mix of various unit in the acute hospital, 1 in a community hospital and lastly 1 in a geriatric medical ward. 1 of the study secondary outcome was delirium incidences (Inouye et al, 2006) which is the primary outcome for this systematic review. Kratz et al, (2015) conducted a prospective intervention study on the prevention of postoperative delirium. The study was conducted in a total of 16 months, n=292 patient participated in the study, n=178 took part in the prevalence phase which was carried out for 6months and n=114 were enrolled for the intervention phase for 10 months.

The mean age of participants in the prevalence phase was 76.8 years and n= 96 (53.9%) of the participants were women. The predictors of postoperative delirium reported are age P <0.034, odd ratio (1.08), (CI,1.01-1.16), MMSE <27 (P <0.002,OR (4.18), (CI, 1.71-10.20), Barthel

index < 85, (P=0.069, OR (2.44), (CI, 0.93-6.37), infection P < 0.019, (OR 3.16, CI 1.21-8.26).

In the prevalence phase, all through the study, n=36, (20.2%, CI 14.6-26.4) of (n=178) developed postoperative delirium. The intervention group enrolled n=53 in the control group with a mean age of 76.6years, n=25 (47.2%) enrolled were women and n=61 were in the intervention group with mean age of 77.8 years, n=39 (63.9%) were women.

Further, HELP protocol provided to the intervention group were early mobilization n=51 (83.6%), improved sensory n=41 (67.2), improved nutritional and fluid intake n=31(50.8%), improved sleep n=57(93.4%), cognitive activation n=57(93.4%), validation n=61(100%). In the intervention phase there was significant

difference between the control and intervention group. n=11 (20.8%) (95% CI;11.3-32.1) of the control group developed delirium, while n=3(4.9%) (95% CI 0.0-11.5) of the intervention group developed delirium. Also, there was a significant difference in delirium rate with the x^2 test (x^2 =6.60, n=114, df=1; P=0.01). Overall, the study concluded that HELP lowers the risk of delirium in elderly patients postoperatively.

In a cross-sectional survey study done by Inouye et al, (2006) that included 13 HELP dissemination site and enrolled 11,344 participants showed HELP to improve older patients' outcome and reduce the rate of delirium and functional decline. Data for the survey was collected from the participating sites through www.surveymonkey.com in a 75 open and closed ended questioner formulated for the collection of specific, detailed and descriptive elements of the participating HELP sites. All participating sites were acute hospitals and had similar characteristics.

The participating sites characteristics are represented as follows teaching hospital n=12(92.3%), non-profit n=13(100%), presence of geriatric nurses n=12(92.3%) and geriatric consultant n=13(100%). The median age range reported of the participating patients are $\geq$ 65 (43.5% (SD 8.6-75.0), $\geq$75 (31.8% (SD 10.7-75.0) and $\geq$85 (10.1% (4.35-40.0). Furthermore,

across all 13 HELP sites, the HELP protocol provided were orientation n=10 (76.9%), early mobilization n=7 (53.8%), therapeutic activities n=11 (84.6%), vision n= 9(69.2%), sleep enhancement n=4(30.8%), rehydration n=9(69.2), feeding assistance n= 9 (62.9%). Delirium rate was tracked across n=11 (84.6%) of the HELP sites. This study concluded that HELP protocol is effective in the reduction of delirium rate. Furthermore, n=13(100%) of the HELP sites showed HELP to be effective in improving hospital outcomes for elderly patients during their admission, this include reduction in delirium rate.

Wang et al, (2019) carried out a randomised control trial on post-operatively elderly patients in a surgical unit. The primary goal of the study was to investigate the effectiveness of t-HELP in preventing post-operative delirium. The patients in this study were randomised into 2 groups using an intention to treat approach, both groups received nursing care in 2 12 nursing unit, had similarity in their clinical and demographic characteristics.

1. t-HELP intervention = n 152
2. Control group = n 129

The study showed participants who received t-HELP had a significant statistical reduction in post-operative delirium rate within 7 days, with a relative risk of 0.14 (95% CI, 0.05-0.38) p<0.01. Also, after readjustment of sex, age, and to the kind of procedure done surgically, there was still a significant difference between the intervention and control group with a relative risk of 0.07, (0.02-0.26, 95% CI) p <0.01. Furthermore, a sensitivity test was done to analysis the robustness of the findings, there was still a significant difference in the incidences of delirium between both groups with a relative risk 0.41, (95% CI,0.21-0.78) p <0.06. Patients who received t-HELP developed less severe form of delirium as compared to the control p<0.08. In total, this study concluded that t-HELP is effective in the reduction of post-operative delirium in elderly patients.

Also, Chen et al, (2017), study was conducted on the effect of m-HELP on delirium.377 patients partook in the study with a mean age SD 74.3 in the intervention cohort n= 197 and a mean age SD 74.8 in the control group, n=180. There was a statistically significant difference between the control and intervention group. A total number of 40 (10.6%) cases of delirium was recorded in both groups during their hospital stay. However, 13patients (6.6%) in the intervention group developed delirium, moreover 27 patients (15.1%) in the control group developed delirium. The study showed a 56% reduction in risk of delirium, which is evident with a relative risk of 0.44, (P= .008, 95% CI,0.23-0.83).

The intervention (m-HELP) showed a significant cumulative incidence of delirium (P .02, X^2=5.87). When broken down into types of surgical procedures, participants who had total gastrectomy m-HELP recorded 1(2.3%), while the control group 8(18.6%) P= .03, right hemicolectomy m-HELP 1(3.1%) control 2(6.3%) p >.99 , left hemicolectomy m-HELP 6

(9.0%), vs 10(14.9) P=.43, pancreaticoduodenectomy m-HEP 2(8.0%) vs 6(28.6%) P=.12, other abdominal surgeries m-HELP 3(10.3%) vs 1(6.3%) P>.99. Overall, the study demonstrated a significant effect of m-HELP in the reduction of delirium rate in older patients.

Additionally, in a longitudinal study conducted by Rubin et al, (2006) on the replication of hospital elder life program and the effectiveness of the intervention HELP. n=1,225 patients were included at the pre-test phase, with a mean age SD=80.6 (6.2) and n=704 HELP participant (intervention phase) for the post-test. The patients in the HELP phase had a SD age 80.9(6.7). Both participants in the pre and post-test had the similar baseline characteristics. Charlson Comorbidity index of (P=.30), sex (P= .95), age (P=.11). The study showed a reduction rate from 40.8% at the baseline phase (pre-test) to 33.0% in the phase in and 26.4% at the intervention phase (post-test). There was a significant difference (P=<0.02) in the rate of delirium from the baseline to intervention phase.

The corresponding delirium rate was 35.3%. At the first year of full implementation of HELP, delirium rate was reduced to 34.3% and was further reduced to 32.3% after the second year of HELP implementation. In a study conducted by Strijbos et al, (2013) patients

were assessed daily for delirious symptoms and the rate of delirious symptoms were also recorded daily using DOS. Also, delirium incidence rate was diagnosed using the confusion assessment method (CAM) and delirium rating scale (DRS-R). This study did not record results of the study.

Secondary Outcome Cost

Inouye et al, (2006) tracked the advantage of HELP in cost saving across n=13 HELP dissemination sites. Overall, cost was reduced in n=10 (76.9%). n=4 (30.8%) of the HELP sites assessed cost effectiveness directly, n=7 (53.8%) of HELP site showed that the reduction in delirium led to decrease in cost, n=1 showed that more than one million dollars was saved in cost during initial years. Also, Rubin et al, (2006) assessed the cost effectiveness of HELP. Hospital cost was calculated through proxy measurement of administrative data over a period of 6 month. The estimated 101 cases of delirium prevented saw a total saving in cost of

$220,281. The cost per delirium patient in the study was $4,995 versus $2,814 spent per patients without delirium. The study concluded HELP is effective in reducing hospital cost when implemented.

LOS

Chen et al, (2017) assessed the effect of HELP on the length of stay in the hospital. The median LOS between the intervention and control group was 12.0 days against 14.o days in the control group. There was a significant difference between the control and intervention group in their length of stay p= .04. The study concluded that HELP is effective in reducing the length of stay in the hospital in older patients. Additionally, Wang et al, (2019) study assessed the length of stay in the hospital after the implementation of HELP. The LOS mean in the intervention group was shorter than that of the control group 12.15(3.78) days vs 16.41 (4.69) days respectively, p< .001. The study concluded that HELP shortens hospital LOS in elderly patients.

Discussion

Delirium is a major complication seen in hospitalised elder patients, which results into death, or admission into long term care facilities, increased LOS and high operating hospital cost (Witlox et al, 2010; Inouye et al, 2014; Kartz et al, 2015). There are various predisposing factors that leads to the development of delirium in the elderly. Some of those factors are infection, dehydration, social isolation, malnutrition, anaemia and cholinergic activity changes due to the undue effect of sedation and anaesthesia post-operatively (Young& Inouye 2007; Cavallari et al, 2015; Inouye et al, 2014; Silverstein, 2014; Scholz et al, 2016). However, the incidences of delirium can be reduced among hospitalised older patients with the use of multicomponent approach (Strijbos et al,2013).

HELP is an imitable care bundle designed for the prevention of delirium that entails the use of trained volunteers and highly skilled multidisciplinary staff in the implementation of its protocols (Inouye et al, 1999; Inouye et al, 2000). HELP intervention protocols involve daily visitation/orientation of the older hospitalised patients, enhancing vision, hearing by ensuring prescribed aids are used daily, feeding assistance, sleep enhancement, early mobilization, and making available therapeutics activities (Inouye, 2006). This systematic review is a comprehensive overview of critically analysed data on the effect of HELP in the incidences of delirium, with secondary outcomes of cost and LOS.

All studies included in this SR were heterogeneous in their study designs. Five of the included studies had a primary outcome on the incidences of delirium and 1 of the studies had incidences of delirium as a secondary outcome. Overall, all the studies agreed that HELP is effective in the reduction of delirium incidences among the elderly in the acute hospital. Chen et al, (2013) study showed that the incidences of delirium were reduced significantly by 56% as well as a significant drop of 6 days in the length of hospital between the intervention and control group after the implementation of hospital elder life program.

Also, the meta-analyses carried out by Wang et al (2019) showed HELP was effective in the reduction of delirium incidences when the all components of the program are implemented, with the inclusion of family involvement in patients care. These studies correspond with the findings of 14 multicomponent meta-analysis that showed when at minimum 2 to 6 of HELP component are implemented, delirium rate is likely to be effectively reduced by 44% (Hshieh et al,2015).

Furthermore, Kratz et al (2015) study indicated that MMSE, age and pre-existing infection are predisposing factors to delirium in the elderly. Also, only 4.9% of patients who were provided with HELP developed delirium as against 20.8% who developed delirium in the control group. These findings are supported by a study on multicomponent delirium intervention (Zaubler et al, 2013). Rubin et al (2006), study showed delirium rate is reduced and maintained overtime when HELP intervention is targeted at identified risk factors and those at intermediate risk. This finding corresponds with a predictive model for delirium in older patients (Inouye et al,1993).

Also, HELP showed to be cost effective in the study by Inouye et al (2006), HELP saved health facilities up to $1 million in its first year of implementation. This result is consistent with the findings of the economic value of multicomponent intervention in the prevention of delirium (Rizzo et al,2001). In the findings by Rubin et al (2006), HELP led to the saving of

$626,261 in cost over 6 months, and $2,181 per delirium prevented in a patient. This finding supports the results of cost associated with delirium (Leslie,2008). HELP was found to be effective in the

reduction of LOS. In 2 different studies HELP reduced hospital LOS by 4 to 6 days (Chen et al,2013; Wang et al,2019). However, in a metanalyses of nine studies there was no significant difference in LOS in patients who received HELP and the control group (Hshieh et al,2018).

Limitations

Some limitations in this study are worth mentioning despite its quality. The heterogeneity of included studies could impact definite conclusion on the outcomes. Furthermore, most of the included studies focused on post-operative delirium and were carried out in surgical units. This may lead to the overestimation or underestimation of the effectiveness of HELP. Also, 1 of the study had no result reported, and 1 was a QI program with the delirium rate measured with proxy administrative data. Moreover, majority of the study had the creator of HELP as a co- author, this could result into a conflict of interest and impact on the outcomes reported.

Conclusion

Delirium in the elderly could pose as a major risk of mortality, cognitive decline, institutionalisation, increased length of stay and hospital cost. Study has shown that the first step in reducing delirium rate is the identification of risk factors and at-risk patients by the healthcare team. Furthermore, implementing the hospital elder life program in the acute hospital could be effective in reducing delirium rates thereby reducing length of stay and cost. However, more studies are needed in the acute medical geriatric unit. Also, independent studies without the innovator of HELP as a co-author on the effectiveness and feasibility of HELP implementation in the acute hospital globally is highly recommended.

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