Abstract

Delirium is a serious and common disorder especially among older people on inpatients units. Numerous modifiable or manageable delirium risk factors have been identified. As a result, there is now a widespread notion that many cases of delirium can be prevented. In this review, published data evaluating non-pharmacological interventions for delirium prevention were assessed in relation to their efficacy. Currently, most published studies are based on direct targeting of risk factors and/or introduction of educational programmes to increase staff knowledge and awareness. However, there continues to be a dearth of randomised controlled trials evaluating non-pharmacological interventions, partly because of the inherent difficulties associated with delirium research in general and with the evaluation of non-pharmacological interventions in particular. Instead, many of the available studies have been observational or non-randomised in nature. Nevertheless, the majority of these support a role for non-pharmacological interventions in delirium prevention. While more research is certainly needed, the majority of available data are based on best practice protocols, guidelines and interventions. Hence, a consistent and concerted effort is now justified to introduce non-pharmacological prevention strategies across units to help tackle the increasingly prevalent delirium among older people.

Keywords: non-pharmacological, delirium, intervention, prevention, older people, elderly

Introduction

Delirium is one of the most frequently encountered disorders in general hospitals. Among medical in-patients, the occurrence rate per admission varies between 11% and 42% [1]. Delirium is strongly associated with increased morbidity [2], length of hospital stay, risk of residential and nursing home placement, as well as reduced functional status after discharge from hospital [3]. The disorder also has a significant mortality rate among hospitalised older patients ranging between 25% and 33% [4].

Not long ago Britton and Russell [5] reported that delirium continued to be managed on an empirical basis with no evidence-based guidelines on diagnosis and management. It is recognised that many patients will continue to have a poor outcome despite supportive care [6]. Systematic detection and multi-disciplinary care of established cases showed no significant benefit compared to standard care and no significant impact on severity or recurrence rates [4, 7]. Furthermore, guidelines alone issued to staff failed to improve the process and outcome of care in patients who have already developed delirium [8]. As a consequence of the limited effect of currently available treatment for established cases, interest has been directed towards interventions to assess their effectiveness in prevention. To date, there is no evidence that pharmacological interventions can prevent delirium. In contrast, several non-pharmacological intervention studies have been shown to be efficacious. In the sections below a review of some of the evidence will be sought from published data in relation to non-pharmacological interventions. Such underutilised approaches may yet prove to be very helpful in stemming the delirium epidemic.

Non-pharmacological approaches in delirium prevention

Prevention plays an essential role in the overall management of many disorders. In the case of delirium, preventive strategies are most appropriate as many risk factors have already been identified and many of these can be modified or managed [9, 10]. Even when risk factors such as age, gender and the presence of underlying dementia cannot be modified, their identification may influence the response to intervention.
efforts [11]. Non-pharmacological studies have mainly included targeted interventions directed at delirium risk factors, the establishment of protocols, staff training and the provision of expert consultation. In recent years, the role of educational intervention has also been assessed in relation to prevention. The efficacy of educational programmes is likely to result from enhancing awareness of delirium risk factors and the identification of at risk patients.

Targeting risk factors

Data indicating that delirium can be prevented through the active targeting of modifiable risk factors are not new. However, methodological difficulties and inconsistencies have affected the generalisation of results and the clear establishment of protocols and strategies. An early review assessing the effectiveness of interventions to prevent delirium in hospitalised patients was carried out in 1996 [12]. Although the authors were able to select 10 trials for inclusions, these had no restriction on either type or number of patients enrolled. They also differed significantly in their design, methodology, criteria for delirium, type of intervention, sample size and outcome measures. Hence, an overall estimate of the risk difference was not calculated. Nevertheless, the authors were still able to state that the evidence suggested that a broad spectrum of preventive interventions may be modestly effective in reducing the frequency of delirium among some patients’ subpopulations. Since then, further studies have taken place; however, similar difficulties continued to exist which made true comparison difficult to do and meta-analysis unachievable.

One of the most influential studies targeting delirium risk factors has been that of Inouye et al. [13]. Inouye and colleagues assessed the efficacy of a multi-component intervention programme for delirium prevention in older people through a controlled clinical trial. The study specifically targeted six risk factors based on evidence of strong association with delirium. These included sleep deprivation, immobility, cognitive impairment, hearing impairment, visual impairment and dehydration. A treatment programme was devised to manage each of these risk factors according to local protocols and strategies. An early review assessing the effectiveness of interventions to prevent delirium in hospitalised patients was carried out in 1996 [12]. Although the authors were able to select 10 trials for inclusions, these had no restriction on either type or number of patients enrolled. They also differed significantly in their design, methodology, criteria for delirium, type of intervention, sample size and outcome measures. Hence, an overall estimate of the risk difference was not calculated. Nevertheless, the authors were still able to state that the evidence suggested that a broad spectrum of preventive interventions may be modestly effective in reducing the frequency of delirium among some patients’ subpopulations. Since then, further studies have taken place; however, similar difficulties continued to exist which made true comparison difficult to do and meta-analysis unachievable.

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Educational intervention

Rockwood [17] has argued that in the absence of specific therapies for delirium prevention or treatment, most interventions are educational in nature. Rockwood has further emphasised the need to examine educational interventions in terms of ‘knowledge gained, actions produced and patient outcomes achieved’. The argument is that educational interventions should be based on principles of adult learning. Such programmes need to utilise best practice teaching and learning techniques relevant to individuals need.

Lundström et al. [18] assessed the effect of a programme consisting of several interventions which included staff education, improved ward environment, active nutrition and prevention of complications associated with delirium. The authors reported that following the intervention, the incidence of delirium was significantly lower than previous reports. One significant limitation of this study was the lack of a control group with comparison being made with ‘historical cohorts of corresponding patients’ admitted to several hospitals. Another study directed at nurses was carried out by Brymer et al. [19] who measured the impact of a 1-day geriatric educational workshop delivered to emergency nurses. Utilising adult education principles, the personal learning priorities and current practices of nurses were initially assessed and priorities identified before the development of the workshop. The workshop consisted of three case-based didactic sessions focusing on topics such as delirium. The educational programme was subsequently subjected to self-evaluation a month later by participants. Fifty-one nurses who completed the study reported significant change of practice. A major

patients developed delirium in the intervention group (32%) compared to the usual-care group (50%).

Non-pharmacological approaches have also been employed to target the overuse of medication associated with delirium. Fosnight et al. [15] used ‘academic detailing’ to produce a 30–50% decrease in the use of some of the high-risk drugs. A pharmacy computer system generated a report on all patients over the age of 65 years who were prescribed such drugs. The pharmacist then contacted prescribing physicians raising their awareness and explaining the problems associated with the prescribed drug and providing reference materials supporting the recommendations.

The trend showing a positive response to non-pharmacological interventions has been sustained in more recent reports. It is likely that most modifiable risk factors for delirium can be a subject to prevention protocols. In an interesting pilot study, Taguchi et al. [16] targeted circadian rhythm to test the influence of bright light therapy on the rate of postoperative delirium in an intensive care setting. The rate of delirium was significantly lower among those receiving the active intervention of bright light compared to subjects receiving natural light.
strength of the study was prior assessment of staff skills and needs in relation to the management of older people. This study clearly emphasised the importance of engaging staff at an earlier stage in the design and development of intervention programmes.

Recently, it was shown that a specially designed delirium educational programme by experts in the field and directed at both doctors and nurses significantly reduced the point prevalence of delirium [20]. The educational package consisted of formal presentations involving doctors and nurses, written management guidelines and follow-up sessions. The follow-up sessions were based on one-to-one and small group discussions. The aim was to provide continuous support to staff through emphasising and reinforcing learning and providing an informal and non-judgemental environment to test knowledge and the level of retained information. A supportive feedback was then tailored to help individuals identify and remedy any deficiencies. Two hundred and fifty acute admission participants over the age of 70 years were recruited from two wards. The point prevalence of delirium was significantly reduced on the intervention compared to the control ward (12/122 and 25/128 respectively; \( P = 0.034 \)). Again, randomisation was not possible in this controlled trial because admission to wards was primarily dictated by bed availability.

At about the same time, Naughton et al. [21] published the results of a before and after multi-factorial intervention study aimed at reducing the prevalence of delirium. The intervention was designed to improve recognition and management of delirium in medically ill patients. Published literature, data collected during the baseline period and clinical experience were used to develop guidelines used in the intervention. The programme reviewed the base-line data on the prevalence and the outcome of delirious patients, provided sensitivity training on cognitive impairment, trained staff in methods of mental assessments and introduced guidelines for medication management. The educational programme was delivered through a series of small group meetings and grand rounds. The baseline cohort included 110 patients hospitalised for at least 4 days. Two further cohorts were recruited at 4 and 9 months (postintervention) after the initial education phase of the intervention was completed. The prevalence of delirium was 40.9% at baseline, 22.7% at 4 months (\( P < 0.002 \)) and 19.1% at 9 months (\( P < 0.001 \)).

Similarly, Pierre [22] reported on a delirium continuous process improvement multi-disciplinary team where the primary intervention was to reduce the incidence of delirium. The team carried out a delirium education intervention directed at doctors and nurses with a main emphasis on prescribed medication, particularly dosages considered inappropriate for older people. Nurses attended clinical update series using didactic and poster sessions. Teaching included areas related to the aetiology of delirium, the medication implicated and the assessment needed. Nurses were also encouraged to consult pharmacists so that a review could be undertaken of patients considered to be acutely confused. Doctors received two different presentations. Further, posters were displayed for 1 month in areas used by ward staff. Clinical pharmacists also received informal education regarding the delirium improvement initiative. Twenty-three drugs were targeted for reduced use. The frequency of use was calculated at 6-month intervals (before, during and after the educational interventions). The authors reported that there was a 57% reduction in the use of targeted drugs following the educational intervention. However, the authors accepted that their educational intervention may not have been adequate to effect consistent behavioural change. This is because such a change in behaviour is a complex process for which a variety of learning methods are needed.

Lundström et al. [23] assessed the efficacy of a postoperative multi-factorial intervention programme for delirium among 199 patients above the age of 70 admitted either to a specialist postoperative care unit or to a usual care unit. The intervention included a 4-day staff education course. Focus was also directed at the assessment, prevention and treatment of delirium, teamwork and individual care planning. In addition, the intervention also included the targeting of several delirium risk factors. The authors reported that fewer patients on the intervention ward were delirious postoperatively compared to controls (56/102 and 73/97, respectively; \( P = 0.003 \)).

Of course, not all studies have shown a benefit for educational programmes in the prevention of delirium. Milsen et al. [24] carried out a before and after study to test the effect of a nurse-led interdisciplinary intervention programme comprising education of nursing staff, provision of consultation service and the use of a scheduled pain protocol. The authors found that the incidence of delirium was not significantly lower following the implementation of the programme.

Notwithstanding several methodological limitations which will be discussed next, the results from the majority of studies clearly highlighted the value of educational strategies and the targeting of risk factors. The implementation of such programmes may carry the promise of decreasing the prevalence of delirium on hospital wards. A worthwhile process at the local level is the clear identification and recognition of delirium risk factors which is a prerequisite for preventive action. Many of the predisposing and precipitating risk factors are amenable to modification or early treatment. Staff caring for older people need to be reminded of these risk factors as part of educational programmes. For example, conditions such as electrolyte imbalance, infections, constipation, dehydration and sleep disturbances need to be identified and treated according to accepted protocols. On the other hand, several delirium risk factors cannot be ‘treated’ such as gender, ageing and dementia. However, these can be utilised to identify at risk populations [11].

Based on available evidence so far, well-designed intervention programmes incorporating a host of best practice guidelines can be implemented and may play an important role in the prevention of delirium. Delirium is more prevalent in certain individuals, and hence the identification of those at high risk is an important step to help in proper targeting of intervention strategies. This needs to be followed by
Non-pharmacological interventions in the prevention of delirium

Table 1. Essential approaches and practical steps of an intervention programme for the prevention of delirium

<table>
<thead>
<tr>
<th>1. Identify high-risk individuals</th>
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<tr>
<td>Non-treatable delirium risk factors</td>
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<tr>
<td>Old age</td>
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<tr>
<td>Underlying dementia</td>
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<td>Male gender</td>
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<td>Previous history of delirium</td>
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<td>Significant medical history</td>
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<td>Poor eyesight and hearing</td>
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<td>Frailty</td>
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<td>Immobility</td>
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<tr>
<td>2. Initiate active preventive strategies (directed at all, but especially targeting those at high risk)</td>
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<tr>
<td>Identification and prompt management of any treatable delirium risk factor</td>
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<td>Additional steps should include</td>
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<td>Caring in an appropriately lit environment</td>
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<td>Keeping number of staff caring for each individual to a minimum</td>
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<td>Make patient familiar with clinical staff</td>
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<td>Proper introduction and explanation by staff</td>
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<td>Increase awareness among staff of delirium and its prevention</td>
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<td>Increase awareness of sundowning syndrome</td>
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<td>Ensure glasses and hearing aids are brought to hospital</td>
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<td>Reminders to time and date</td>
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<td>Review medications</td>
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<td>3. Recognise delirium prodromal symptoms such as</td>
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<tr>
<td>Sudden and fine changes in mental state</td>
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<td>Unexplained confusion</td>
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<td>Shouting</td>
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<td>Restlessness</td>
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<td>Emerging hypoactivity</td>
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<td>Sleeping difficulties</td>
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</table>

Methodological limitations of non-pharmacological intervention studies

Cole [25] identified general limitations in delirium studies’ design and methods used and heterogeneity of subjects recruited. Clinical trials are often subject to the contamination effect which may occur when staff on a treatment unit unwittingly transfer knowledge and skills gained for the purpose of a study to the control unit. In addition, it is also often difficult to assess whether successful prevention observed following an intervention programme has resulted from the intervention components or from corresponding increase in general awareness and skills. Another difficulty encountered is the generalisation of results. Data obtained in a particular patients’ population can only reflect that population and its characteristics. Delirium is a complex and fluctuating disorder which can be difficult to diagnose. Diagnostic scales have helped in defining caseness in research studies, but continued difficulties in diagnosis are reflected by the wide range of prevalence and incidence rates reported.

In many instances, non-pharmacological interventions especially educational programmes for delirium preventions do not lend themselves to the requirements of RCTs. Observational studies and non-randomised cohort clinical trials can still provide useful and valuable information [26]. It must also be recognised, however, that the dearth of delirium prevention RCTs is not limited to non-pharmacological studies. Recently, Siddiqi et al. [27] carried out a Cochrane systematic review with the primary objective of determining the effectiveness of interventions designed to prevent delirium. In this review, only original reports of RCTs were included and all non-RCTs excluded. Only six studies met the authors’ selection criteria. The selected studies tested various interventions on surgical units. Even among the included studies, only one [14] clearly achieved the adequate power needed to test the effectiveness of the intervention in prevention of delirium. Interestingly, this was the only non-pharmacological study among those selected. This indicated that methodological limitations in delirium prevention studies are not limited to specific type of studies.

Many of the difficulties encountered by the earlier systematic review by Cole et al. [12] still exist. It is not possible to date to carry out a meta-analysis especially on non-pharmacological interventions because of the significant heterogeneity of the methods and designs used and populations tested. Milisen et al. [28] suggested that the ‘perfect’ delirium prevention study is difficult to implement in real world healthcare settings. This is due to many factors not least among them the contamination bias and countless confounding factors. Watson et al. [29] highlighted broader concerns about the validity of using experimental methods in research pertinent to human activity. It is these authors’ view that the RCT ‘assumes a high degree of passivity on the part of the participant and neutrality on the part of researcher’. Concato et al. [26] also argued that well-designed cohort or case-control studies did not systematically overestimate the magnitude of the associations between exposure and outcome as compared with the results of RCTs of the same topic. Of course, the priority will always be for randomisation and blinding whenever possible. However, this is more difficult when evaluating approaches such as educational interventions in a condition such as delirium. In such circumstances, a properly carried out non-RCT, where limitations are clearly shown, is preferable to a flawed RCT.

Conclusion

Pharmacological therapy is widely used in established cases of delirium, but its efficacy and influence on the outcome...
is not clearly proven. The single best approach to the management of delirium remains the identification of underlying causes. In contrast, there is increasing evidence from non-pharmacological interventions that these may be helpful in delirium prevention. Of course, methodological issues relating to many of the published non-pharmacological prevention studies need to be recognised when interpreting the results. However, data from studies directly targeting risk factors and/or testing the efficacy of educational intervention programmes have been promising. Certainly, further research would be needed to cement a role for non-pharmacological intervention in the prevention of delirium.

Many of the encouraging findings from studies on non-pharmacological interventions for delirium have been based for the most part on current best practice. Unfortunately, these findings have not been translated into concrete action on ward level. Delirium continues to be very prevalent among hospitalised older people although accumulating evidence indicated that some cases, at least, may be preventable. The poor understanding of delirium by staff stems from a historically low educational emphasis on delirium in medical and nursing schools. Further, until recently there has been little emphasis on delirium prevention which is in part due to limited clear evidence of its effect. However, as more research has become available in highlighting delirium risk factors and their role in prevention, it is becoming essential to assess the potential for the wide application of these intervention programmes in clinical settings. What is really needed now is a change of culture and care processes through increasing awareness and knowledge of staff caring for older people on acute wards. In this respect, the implementation of well-designed educational programmes can be very helpful and need to be explored further.

**Key points**

- Delirium is a very common disorder especially among older people admitted to hospitals.
- Delirium continues to be associated with significant morbidity and mortality, and current treatment remains at best symptomatic.
- There is now increasing evidence that many cases of delirium can be prevented through various non-pharmacological interventions utilising educational and non-educational approaches.
- A concerted effort is now needed to introduce some of these approaches to wards to help in the prevention of delirium.

**Conflicts of interest**

No conflicts of interest.

**References**

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