

Recommendation from the Danish Health Technology Council concerning

## The use of intelligent hospital beds in intensive care and neurological units

### Recommendation from the Danish Health Technology Council:

**The Danish Health Technology Council does not recommend a general, national implementation of intelligent hospital beds, but acknowledges that there may be local conditions that support the use of intelligent hospital beds in intensive care units.**

#### About this recommendation:

The Danish Health Technology Council notes that the current evidence base is limited, which is why the council does not recommend a national implementation of intelligent hospital beds.

The Danish Health Technology Council acknowledges that intelligent hospital beds are implemented in some intensive care units in Denmark and does not recommend that these are phased out. Based on the findings of the analysis, the Danish Health Technology Council also acknowledges that intelligent hospital beds have the potential to release staff resources when performing certain tasks, especially with unstable and immobile patients in intensive care units. However, these findings are subject to significant uncertainty.

In addition, the analysis suggest that intelligent hospital beds have the potential to improve the physical work environment when performing certain tasks in intensive care units, such as daily weighing of intensive care patients. However, the extent of the potential is unclear. The Danish Health Technology Council emphasizes that the realization of intelligent hospital beds' value depends heavily on thorough training, continuous use of integrated functions, and competence maintenance of the staff.

The Danish Health Technology Council notes that if a local implementation of intelligent hospital beds is desired, attention should be paid to the above-mentioned, including the hospital's facilities. In addition, the proportion of intelligent hospital beds should constitute a minimum share of the total bed capacity to maintain staff competence and fully utilize the bed's functions.

Due to the need for further evidence, the Danish Health Technology Council appeals to the regions and suppliers to contribute to the generation of new knowledge regarding intelligent beds, preferably with a focus on the physical working environment and resource consumption.

Overall, findings in the analysis indicate that intelligent hospital beds are most valuable for critically ill and immobile patients who cannot be mobilized out of bed.

Based on the current evidence base, the Danish Health Technology Council cannot comment on the value of intelligent hospital beds in neurological units.

**About the technology**

Intelligent hospital beds are defined as hospital beds with control panels and the following integrated functions: weight (class III), bed-exit alarm, continuous lateral rotation therapy, pressure-relieving mattress with static function, and the ability to adjust the bed to a seated position.

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**Patient population**

The recommendation concerns hospitalized adult patients who are at high risk of developing complications due to their medical condition and immobility. The population is further divided into the subgroups:

- Unstable, intensive patients
  - Stable, intensive patients
  - Neurological patients
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**Scope**

The recommendation applies to Danish public hospitals.

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**Implementation**

If local conditions favouring the use of intelligent hospital beds, the individual hospital should be aware of conditions that can ensure effective use in the daily workflow. In particular, the individual unit should consider the setting for transporting patients in intelligent hospital beds, adequate and continuous training, cooperation with relevant professional groups on changed workflows, and any local adaptations that may prove necessary.

Where intelligent hospital beds are used, consideration should be given to gathering relevant data to contribute to the evidence base and future decisions on use.

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**Tendering procedure**

No proposal for a national tendering procedure.

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## Analysis report summary

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### About the analysis

The recommendation from the Danish Health Technology Council is based on the expert committee's analysis report regarding intelligent hospital beds for use in intensive care and neurological units. The purpose of the analysis is to answer the following questions:

*Should intelligent hospital beds be used instead of standard hospital beds, possibly with pressure-relieving mattresses, for patients admitted to intensive care and neurological units?*

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### Clinical effectiveness and safety

The systematic literature search did not identify any relevant literature examining the effect on patients of intelligent hospital beds compared to standard hospital beds. Therefore, the outcomes have been answered based on two reviews, concerning alternating pressure air surfaces and reactive air surfaces as well as a prospective, randomized study regarding lateral rotation therapy. The expert committee notes that the results from the included studies relate to a single function, which is not equivalent to intelligent hospital beds. In addition, the expert committee states that the confidence in the effect estimates from the prospective randomized study is very low. Therefore, the results are not included in the overall assessment. In addition, it has not been possible to identify evidence for several predefined outcomes or consider the different subgroups due to limited evidence. Overall, the expert committee states that the evidence for the effects of intelligent hospital beds compared to standard hospital beds is limited. Based on this, the expert committee concludes that the perspective *clinical effectiveness and safety* cannot be included in the overall assessment, and there should be more evidence before examining the effect of intelligent hospital beds.

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### Patient perspective

The expert committee states that the *patient perspective* cannot be included in the overall assessment, as it has not been possible to include the patients' experiences and attitudes towards intelligent hospital beds as opposed to standard hospital beds.

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### Organisational implications

The *organisational implications* of using intelligent hospital beds compared to standard hospital beds are considered in relation to the topics of physical work environment, dissemination, experiences, needs, resource consumption and implementation.

Based on the available data, the analysis indicates that intelligent hospital beds may have certain advantages for specific patients admitted to intensive care units. Overall, the data indicate that there is a demand and a clinical need for intelligent hospital beds in intensive care units. This is based on experiences from professionals who have experience with intelligent hospital beds. The data indicates that there may be an improvement in the physical work environment if the functions of the intelligent hospital beds are used continuously and according to the instructions.

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Based on the current evidence, the expert committee cannot conclude whether it is reasonable to use this type of intelligent hospital beds in neurological units. However, the analysis indicates that it might not be the functions of the defined intelligent hospital beds that are meaningful and resource-saving for neurological patients.

However, the expert committee have identified some relevant factors that regions or departments should consider if they were to purchase intelligent hospital beds. Overall, the expert committee states that the hospital's physical design must be compatible with the intelligent hospital bed. Secondly, to achieve value for the professionals, there must be a certain amount of intelligent hospital beds so that the health professionals can gain routine in the use of the functions. Next, the findings of the analysis indicate that it is the critically ill and immobile intensive care patients who gain the most value from intelligent hospital beds. However, it will always depend on an assessment from the health professionals. Functions such as integrated weight and chair are experienced as beneficial in relation to the physical work environment and the release of staff time, whereas the bed-exit alarm is not considered relevant for intensive patients.

The analysis also indicates that intelligent hospital beds are perceived as a disadvantage when the patient is fully or partially mobile. In addition, the expert committee notes that the intelligent hospital bed's width and height, the control panels' location, and the lack of compatibility with other aids are a challenge for the health professionals' physical working environment. Cleaning intelligent hospital beds is more time-consuming, and often the intelligent hospital beds must be cleaned on site, which can be experienced as a disadvantage.

The expert committee notes that the analysis does not include bariatric patients. However, this may be relevant as the BMI of the population is increasing and intelligent hospital beds are wider and longer compared to standard hospital beds.

Overall, the expert committee concludes that there is a need for more evidence on the organisational implications of intelligent hospital beds. Furthermore, the current evidence is both positive and negative towards the use of intelligent hospital beds. Therefore, the expert committee cannot conclude whether the intensive and neurological units should use intelligent hospital beds rather than standard hospital beds.

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## Health economics

The cost analyses within health economics represent the best possible estimate that can be made at this time, based on the data collected in connection with the analysis. The results of the cost analyses indicate that it is cost-saving to use intelligent hospital beds for the care and treatment of unstable and stable intensive care patients, as the execution of a range of work processes is associated with a reduced resource consumption compared to the execution of the same work processes in standard hospital beds. The cost savings should be interpreted as possible release of staff time for other treatment tasks. For neurological patients, the result points towards an additional cost when admitting this patient group in the type of intelligent hospital bed defined in this analysis.

The expert committee concludes that the uncertainty associated with the data included in the analysis makes it uncertain whether the use of intelligent hospital beds has the potential to release staff time, and what the extent of any such release of staff time in clinical practice would mean. This is due to the fact that workflows are organized differently in the country's intensive care units and are complex processes, where multiple tasks are often performed simultaneously and in succession depending on organization, staffing, procedures, guidelines, etc.

The expert committee concludes that there is a need for stronger evidence before it is possible to conclude on the health economic consequences of the use of intelligent hospital beds compared to standard hospital beds.

The budget impact analysis and the cost analysis should be viewed in relation to each other, as the purchase and implementation of intelligent hospital beds are associated with greater budgetary costs, but which may have the potential to result in the release of staff time. Technologies that can release staff time can be valuable due to the current shortage of personnel in the region's intensive care units. However, the expert committee assesses overall that there is a need for further evidence to conclude whether intelligent hospital beds have the potential to fulfil this.

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The quality of the evidence is assessed through either formal quality assessment tools or a qualitative assessment.

Clinical effectiveness and safety: Reviews are assessed using the tool *A Measurement Tool to Assess systematic Reviews 2*, where both reviews show moderate confidence in the results. The prospective randomised study was assessed using the *Risk of Bias tool* (version 2), where the overall assessment of the study is *Some concerns*. The subsequent assessment based on the *Grading of Recommendations, Assessment, Development and Evaluation* shows that there is *very low* confidence in the efficacy estimates, which are based solely on the prospective randomised study.

The patient perspective: There is no evidence to support the patient perspective.

## The quality of evidence

Organisational implications: The evidence consists of four studies, two surveys, a focus group interview, and a discussion. The expert committee did not do a formal quality assessment of the studies due to their study design. For both surveys, there is a concern about validity due to the number of respondents. Furthermore, the expert committee is aware that the respondents' assessment of resource consumption is subject to significant uncertainty, as it is based on a subjective assessment. In addition, for both the focus group interviews and the discussion, it is individual experiences and assessments, and therefore not all nuances have necessarily been captured. Furthermore, the informants in the focus group interviews are primarily health professionals who use intelligent hospital beds, which is why there may be a lack of experience from health professionals who primarily use standard hospital beds.

Health economics: No formal quality assessments have been made. In addition, resource estimates have been included, which are collected under the

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perspective *organisational implications*. The quality of these resource estimates are described under this perspective.

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## About the recommendation from the Danish Health Technology Council

The Danish Health Technology Council's recommendation is intended as an aid for regions when deciding on the use of a given health technology or with regard to organising a treatment area. The analysis report includes a review of the following perspectives: 1) clinical effectiveness and safety, 2) patient perspective, 3) organisational implications and 4) health economics.

This recommendation is based on the Danish Health Technology Council's analysis report regarding intelligent hospital beds for use in intensive and neurological units, which was prepared collaboratively by the expert committee and the secretariat. The analysis report was prepared with the outset in the analysis design and the Danish Health Technology Council's process guide and methodological guidelines. These documents as well as the expert committee's terms of reference are available on the Danish Health Technology Council's website.

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