

# Digitization of Patient Nutrition Intake in Healthcare – The Case of Swiss Hospitals

## Authors

Dr. Thorsten Merkle, Head of Competence Group Hospitality Management, IFM Institute of Facility Management, ZHAW Zurich University of Applied Sciences, Switzerland

Dr. Isabelle Wrase, Head of MSc Real Estate & Facility Management, IFM Institute of Facility Management, ZHAW Zurich University of Applied Sciences, Switzerland

## Abstract

This paper describes the assessment of the economical, ecological and social benefits of digitizing patient nutrition in Healthcare, using the use case of a Swiss tool that measures individual patient nutrition. Improved patient nutrition can reduce treatment costs and food waste, potentially generating benefits to a hospital in all three aspects of the triple bottom line. Using a nutrition intake digitization tool, data on patients' nutrition is generated with a fully automatic procedure relying on a visual system, implemented in hospital kitchens. With our study we seek to explore the extent to which hospitals can benefit from the integration of this tool.

## Introduction

Due to the increasing life expectancy of the population in Western countries, including Switzerland, the overall length of stay of patients in hospitals is rising. This is accompanied by an increase in costs per patient (Schweizerisches Gesundheitsobservatorium, 2020). New ways must be found to make (healing) processes even more efficient so that the average length of stay of patients in hospital can decrease again.

Hospital malnutrition is a prevalent yet frequently under-recognised condition that is associated with adverse clinical and economic consequences. Malnutrition has been reported to be common among hospitalized patients, and its coded prevalence is increasing. It is known to be associated with increased morbidity, mortality and healthcare costs (Barker et al., 2011; Chakravarty et al., 2013; Inciong et al., 2020). Furthermore, malnutrition is associated with many adverse outcomes including depression of the immune system, impaired wound healing, muscle wasting, longer lengths of hospital stay, higher treatment costs and increased mortality (Barker et al., 2011). Hospitalized, malnourished older adults have a high risk of readmission and mortality (Deutz et al., 2019).

A data generation platform and data-presenting user interface have been developed by Swiss company blunergy and put to market test together with a Swiss hospital. The tool called PLATIN measures individual patient nutrition intake and can also identify food returns that have not been consumed. Following technical feasibility, the challenge is to assess the benefits and potential downsides of the tool for hospitals. Ex ante, benefits are primarily expected in the economic sphere whereas risks are

foreseen to exist in the context of employees' technology acceptance and openness to organisational change. With the possibility of automatically measuring individual patient intake, we anticipate a number of benefits for hospitals, and patients.

### **Aims of the study**

The aim of the current study is to identify and demonstrate the benefits of the integration of the tool using the triple bottom line approach, following a holistic view and thus including economic, ecological and social aspects. Since PLATIN technology is new and has not been in use before, our study is novel and contributes to knowledge by assessing the solutions potential from a holistic perspective.

With our study, we sought to answer the following questions:

1. What are the economic, social and ecological advantages of using the tool?
2. How can the quality of patient catering be improved by using the tool?
3. Which other health care facility management areas can benefit from the tool's use?

### **Methods**

Based on the exploratory nature of the study, a qualitative research design was applied (Saunders et al., 2009). Since the study was also characterized by strong collaboration between practice partners and researchers, a strong emphasis was placed on practical relevance throughout (Bradbury, 2015). The exploratory research approach thus allows for a better understanding of the phenomena themselves, as well as the context in which they are encountered. In particular, according to Bradbury (2015), the involvement of those affected by the research is central to developing a practice-based understanding. To achieve this, an interview guide was created, tested, and applied based on the literature review. The data collected in the pre-test with professionals were not integrated into the further analysis (Saunders et al., 2009). Experts were recruited in the Swiss healthcare setting following a purposeful participant selection approach, seeking maximum variation between the healthcare institutions they represented (Bell et al., 2022). Overall, ten experts were recruited and subsequently interviewed using the semi-standardized interview guide in a face-to-face online interviews (Bryman & Bell, 2007). Interviews were transcribed for analysis.

A thematic analysis was conducted following data collection. This explorative procedure is inductively oriented and allowed to summarize answers collected to central themes across all cases (expert interviews) (Döring & Bortz, 2016). For this purpose, the transcribed data was entered into a category system. The initial categories were based on themes that had emerged from the literature review. Subsequently, new categories as well as subcategories were inductively developed as the material was coded (Bell et al., 2022). This allowed themes to emerge and enabled us to interpret and compare participants' statements in each subcategory.

## **Results**

From the point of view of the patient catering process, the focus initially lies on economic and ecological benefits. The PLATIN tool enables the effective amount of food consumed to be recorded on an individual patient basis.

From a management point of view, this allows for more needs-based procurement and storage. In particular, hospitals that only stock limited quantities of food - and are otherwise supplied just-in-time - hope to be able to achieve savings in transport and storage costs. Advantages are also expected in the production process of the patient menus. Due to better analyses between planned and consumed quantities of food, more targeted thus sustainable production is e.g. possible, allowing to reduce food waste quantities. It will also be possible to assess the extent to which the portion sizes of food are correct and to better assess which foods are popular with patients. Based on this data, it is possible to adjust portion sizes or menu compositions. This in turn leads to a reduction in the food cost and food waste. The reduction of food waste was named by the majority of respondents as one of the main reasons for investing in PLATIN.

From the patients' point of view, social benefits were identified. For example, patient safety can be increased based on better traceability of food items, an aspect which is expected to gain in relevance. It was also mentioned that the necessary degree of standardisation, i.e. continuous recording of allergies and intolerances, contributes to patient safety. Furthermore, patients benefit from better support for the sought recovery in the hospital since nutritional aspects can be more easily monitored.

A continuous nutritional screening allows patients (as well as healthcare professionals) to get an overview of their nutritional behaviour and their eating habits, if necessary also beyond the hospital stay. This can be of great benefit, especially for diabetes patients. The technology makes it easy to identify and treat imbalances between food intake and individual physiological needs. Individualised nutrition and dietary supplements and the well-being of patients gain in importance by strengthening a holistic care environment. Not least because non-medical support services are better linked with medical services in a patient-focused way. Whether the technology can improve nutrition to such an extent that malnutrition can be prevented was discussed in various ways. In the acute care sector, where the length of stay of patients is becoming shorter and shorter, this is not expected. In contrast, the potential of this technology for health-promoting or health-maintaining nutrition is considered very promising for geriatric patients in the long-term care sector.

From an nutritionists' perspective, the main advantage of the technology was that the nutrition protocols, which are still kept manually in the majority of the institutions surveyed, could be automated. This would lead to considerable time savings (approx. 6 minutes per patient with a nutrition protocol per day). Another advantage mentioned is that the nutrition protocols could then be collected more comprehensively, i.e. no longer only for selected inpatients with special diets, which would in turn significantly improve the data basis and allow more comprehensive research. Several experts predicted that the technology could contribute to improving interdisciplinary cooperation

between medical and nursing staff as well as between nutrition counselling and the hospitality employees. In addition, the valorisation of the work in the production kitchen was mentioned several times by the experts. By highlighting the process, kitchen work is then more likely to be perceived as valued and valuable by employees, and the understanding is promoted that employees are an active part of the health service to the patients.

From an institutional point of view, according to the experts, there are economic advantages in that the length of stay of patients can be shortened by a healthy and balanced diet, or that readmissions can be avoided. In addition, social benefits were also mentioned, such as the more intensive cooperation between different disciplines and thus the stronger focus on creating a health-making environment.

## **Outlook**

In the following, the results of the study are discussed in light of the holistic triple bottom line approach are discussed.

From an economic perspective, both the literature review and the data analysis show that divergent outcomes of the PLATIN integration are recognized. In terms of patient malnutrition, the research was able to show clear economic implications for healthcare institutions. However, the expert interviews indicate that integration of the system can improve the nutrition of long-term geriatric patients in particular. Critical questions were raised, however, as to whether the system would have an impact on malnutrition among patients in institutions in the acute care sector. There has also been controversy as to whether improving the nutrition of patients can actually shorten the length of stay, thereby saving costs. Uniform opinions prevail with regard to the positive economic effects in terms of the reduction of food waste and the conservation of resources throughout the entire catering process. In terms of marketing, great potential is attributed to sustainability and needs-based patient nutrition.

From an ecological point of view, positive aspects became clear above all from the expert interviews. The more precise and automatic collection of data leads to a reduction in the food cost as well as in food waste. A positive impact on energy consumption due to reduced production and transport has been stated.

From a social point of view, implementation of the system reveals positive factors in terms of both patients and employees. The system can be supportive as a control instrument. An implementation can support and promote interdisciplinary cooperation. Furthermore, according to the experts, patient safety is clearly increased. In general, implementation can promote a positive patient experience, as continuous review of patient meals can result in error prevention, provide patients with information about their eating behavior, and make them feel better cared for. For staff, implementing the system can mean a reduction in workload, especially for work that is time-consuming, tedious, and unattractive. In the event of a mass casualty incident or other illness, this system can help relieve the strain on scarce human and material resources and reduce the risk of triage of patients. This can be seen as appreciative and valuable.



## Literature:

Barker, L. A., Gout, B. S., & Crowe, T. C. (2011). Hospital malnutrition: Prevalence, identification and impact on patients and the healthcare system. *International journal of environmental research and public health*, 8(2), 514–527.

Bell, E., Harley, B., & Bryman, A. (2022). *Business research methods*. Oxford university press.

Bradbury, H. (2015). *The Sage handbook of action research*. Sage.

Bryman, A., & Bell, E. (2007). *Business research methods* (2nd ed). Oxford University Press.

Chakravarty, C., Hazarika, B., Goswami, L., & Ramasubban, S. (2013). Prevalence of malnutrition in a tertiary care hospital in India. *Indian journal of critical care medicine: peer-reviewed, official publication of Indian Society of Critical Care Medicine*, 17(3), 170.

Deutz, N. E., Ashurst, I., Ballesteros, M. D., Bear, D. E., Cruz-Jentoft, A. J., Genton, L., Landi, F., Laviano, A., Norman, K., & Prado, C. M. (2019). The underappreciated role of low muscle mass in the management of malnutrition. *Journal of the American Medical Directors Association*, 20(1), 22–27.

Döring, N., & Bortz, J. (2016). *Forschungsmethoden und evaluation*. Wiesbaden: Springerverlag.

Inciong, J. F. B., Chaudhary, A., Hsu, H.-S., Joshi, R., Seo, J.-M., Trung, L. V., Ungpinitpong, W., & Usman, N. (2020). Hospital malnutrition in northeast and southeast Asia: A systematic literature review. *Clinical Nutrition ESPEN*, 39, 30–45.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson education.

Schweizerisches Gesundheitsobservatorium (Hrsg.) (2020). *Gesundheit in der Schweiz – Kinder, Jugendliche und junge Erwachsene*. Nationaler Gesundheitsbericht 2020. Bern: Hogrefe Verlag