

How to apply data-driven workflow practice from dentistry into hospitals

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Abstract—This paper is elaborating on how the use of real-time data can improve the healthcare processes and service delivery efficiency by designing the patient flow to match the actual needs of the patients, physicians, and medical staff.

Keywords— *Lean, real time workflow management, stress reduction*

I. INTRODUCTION

New lean techniques such as smooth, patient and physicians orientated processes and open-ended appointments could be utilized to reduce slack and stress and to improve the productivity of clinical professionals. This type of approach has become more common, especially in emergency clinics, aspiring to improve the flow of low-complexity patients.

The Finnish solution, Hygga Flow, is an innovative, advanced real-time resource management system that helps healthcare units to reach their full potential through data-driven optimization. Hygga Flow uses advanced algorithms and simulations to dynamically predict and optimize customer flow to efficiently distribute various resources which increases the performance of an organization massively compared to non-dynamic strict old models. One technique Hygga Flow uses is Gradient boosting, which is a machine learning technique used in regression and classification tasks.

The modern operating model leads through information and scales resource needs in real-time well across private and public sectors and benefits both doctors and patients. With over a decade proven efficiency from dental healthcare sector and more than 500 000 treatments with Hygga Flow model, the data-driven solution demonstrably scales also well for other clinical purposes. Findings and observations from operations in a Finnish general healthcare center and according to the Aalto University study¹ (2015) from Finnish public dental care, Hygga Flow truly offers a value-based solution that enables more treatments with one visit. This paper will focus on the main benefits connected to patient flow in the healthcare sector including suggestions on how re-designing the process with better insight of the operations through real-time data, is truly improving the patient journey.

II. CHANGING THE PROCESS, PROVEN EFFICIENCY

A. Flexible timeslots, unhurried overall care

By utilizing data-driven healthcare it is possible to change the patient flow into an efficient patient journey. In Hygga Flow process patient visits, rooms, staff, operations, or

duration of the visits are not specified ahead of time. The model aims at treating patient's health problems in one multidisciplinary session, which reduces the need for separate visits and travelling time. Also, the waiting time in public lobby areas reduces as patients receive accurate information about the start of their appointment and a reminder SMS prior to the appointment, which is beneficial now when social distancing is recommended during Covid pandemic.

Hygga Flow improves availability for clinical services, optimizes process efficiency and truly brings flow to healthcare by improving the patient journey. As an example, the patient has faster access to care as there is no need to cancel appointments, no empty rooms in case a professional is absent, as the next available professional can take in the patient.

B. A comprehensive view and control over the operations

The data collected from the unit's operations is processed to real-time, easy-to-use reports giving valuable insights about the business. A real-time insight in the KPIs help the healthcare units to make daily improvements in operations. The collected data gives a comprehensive view over the available resources while it improves the control over operations and proactively enhances the patient flow.

The Aalto University thesis study¹ researched the dental care in Finland comparing the traditional model and single visit model. The study strongly indicates that unlike the traditional model, the single visit model allows dentists and hygienists to switch rooms and utilizes open-ended appointments and an ERP system to improve the productivity of healthcare professionals. Due to these features and a more homogenous patient and case mix, the single visit model can produce ~90% more procedures and treat ~68 % more patients annually than the traditional model in relation to the number of clinical staff. Per one dentist, the single visit model requires 20 % less nurses than the traditional model. The single visit model results to 44 % less visits, as 80 % more procedures can be performed during a single visit. The simulation suggested that a single visit service line would increase the annual procedure output of a municipal dental care unit without any additional staff. To harness this approach on a larger scale, the proportion of hygienists should be roughly doubled in municipalities. The results of this thesis show that the single visit service model could offer a way to treat the majority of adult patients more efficiently in Finnish municipal dental care.

HYGGA FLOW MODEL: ENHANCED PATIENT JOURNEY

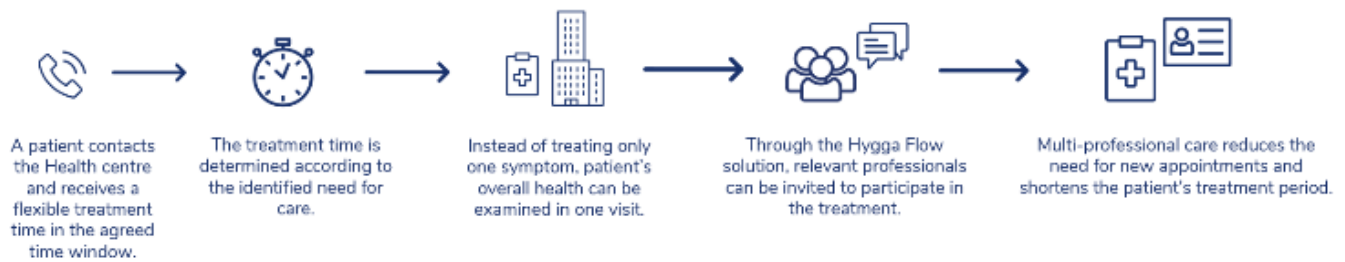


Fig. 1. A single visit model improves the customer experience

III. TRANSITION FROM DENTAL HEALTHCARE INTO GENERAL HEALTHCARE

After more than 10 years of expertise and proven record from dental healthcare sector, it was a time to transit the knowledge and flow optimization for clinical purposes in general healthcare. A pilot case was established into the City of Porvoo Main Healthcare Centre in Southern Finland in 2020.

Fig. 1. indicates that the single visit, Hygga Flow-model ensures that healthcare professionals truly have time for their patients. The single-visit model aims at treating patient's health problems in one multidisciplinary session, which reduces the need for separate visits. Flexible treatment times and seamless patient flow management enables to streamline the use of professional resources, minimize idle time, and reduce healthcare waste. Although the operations vary daily, with the help of the single-visit-model the process and operations are more transparent and all professionals work as a team.

IV. RESULTS FROM PORVOO HEALTHCARE CENTRE

During a one-year pilot period the re-evaluated and re-designed patient flow process gave remarkable results at Porvoo Healthcare Center. First observation from the performance evaluation² (2021) was that up to 56 % of the emergence care patient issues could be resolved without entering the actual treatment room as a triage-based operations were introduced together with Hygga Flow. The care is provided for those who need it the most. For those patients who didn't need emergency care, 30 % of them was given a new scheduled appointment within a week. By using triage-based emergency care together with Hygga Flow, the level of risk has lowered as the patients who need immediate medical attention can be given primarily.

Another advantage of utilizing data-driven process flow was that the waiting time for a doctor reduced by more than 50 %. In emergency care most patients can now be directed directly to the GP without seeing a nurse. Before changing the flow process the waiting time for a doctor was on average at least 95 minutes and during the new flow process the period considered (March 2020-February 2021) the waiting time for a doctor was 47 minutes. Changing the process into more customer centric, the pandemic clinic was also set up by utilizing Hygga Flow and SMS invitations, which helped to minimize the patient-to-patient contact during Covid-19.

Within the scheduled appointments the data driven optimization enables multidisciplinary teamwork throughout the entire healthcare center. The modern system supports channeling resources where it's needed the most and day-to-

day changes can be reacted dynamically to get better sense of the daily flow. The clinical professionals truly have time for the patients, and they can provide more care with one visit with flexible treatment times. With the same resources, doctors can provide 24 % more care compared to a traditional model³. The data show that traditionally given 30 minutes treatment time is not enough. In City of Porvoo more than 70 % of treatments required more than the traditional 30 minutes. With the traditional way, the patient would have been left untreated when time expired and given a new time or having the treatment right away, next patients' appointments would have been delayed. During an evaluation period³, on the appointment side with the use of Hygga Flow 80 % of the patients were treated with one visit and there was no need for a revisit. For those who needed a revisit 13 % of patients had a new appointment made within a week of the treatment. The satisfaction of professionals has also increased. Through a questionnaire sent to the City of Porvoo medical staff⁴, 71 % of the doctors who answered the questionnaire, felt that using Hygga Flow relieves stress and pressure from work.

Table 1 summarizes the benefits achieved with the use of Hygga Flow model both in emergency care and appointment side.

The flow optimization truly improves the customer experience and provides benefits for patients. In City of Porvoo Healthcare Centre the average waiting time is about 2 minutes when the patient arrives on time from the time suggested in the SMS. By utilizing Hygga Flow, it is possible to direct patient to a right place in the right time with digital signage. All in all, patients have faster access to care and customer communication is clearer with SMS invitations and reminders.

TABLE I. ACHIEVED BENEFITS WITH HYGGA FLOW MODEL

Achieved benefits in ER Providing care for those who need it the most	Achieved benefits in GP More care with the same resources
<ul style="list-style-type: none"> • 56 % of the emergency care patient issues could be resolved without entering the actual treatment room • For those patients who didn't need emergency care, 30 % of them was given a new scheduled appointment within a week • The waiting time for a doctor reduced by more than 50 % 	<ul style="list-style-type: none"> • Doctors can provide 24 % more care compared to a traditional model • 80 % of the patients on GP side were treated with one visit, no need for a revisit • 71 % of the doctors who answered the questionnaire⁴, felt that using Hygga Flow relieves stress and pressure from work

By handling real-time data, it improves the operations, provide quality, and gather valuable data to support and optimize the process by reducing waiting times and enhancing the utilization rate of the clinical professionals and equipment. Hygga Flow is suitable for extending the data visibility and

giving a real time control and guidance to any agreed future processes, like optimization of room utilization, waiting times, personnel allocation and motivation, and further data-driven investment decisions.

It serves a data-driven value-based healthcare approach by improving the patient journey, reducing stress with medical staff and physicians, optimizing workflows and better return on investments.

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