Avoiding Hazards – What Can Health Care Learn from Aviation?

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Abstract. Effective methods are needed to identify and analyze risks to improve patient safety. Analysing patient records and learning from “touch and go”- situations is one possible way to prevent hazardous conditions. The eventuality for the incident or accident occurring may be markedly reduced in case the risks can be efficiently diagnosed. Through this outlook, flight safety has been successfully improved during decades. Aviation and health care share many important points and similarities, thus the methods for improving safety could be transferred between the domains. In this paper, text mining and especially clustering is applied to identify lethal trends in both patient records and aviation for comparing and evaluating these trends in the two fields.

Keywords: Health care, aviation safety, text mining, clustering.

1 Introduction

High quality health care is recognized and valued by the European Union as a key human right. Adverse events in health can lead to serious consequences, and it has been estimated that nearly 100,000 patients in the USA die annually from medical errors [1]. The need for increasing health care safety practices is emphasised by Whitehurst [2] by expressing that these errors, which could have been prevented, are discovered to having caused patient suffering, permanent disability, and even death. The patients mentioned may have died from medical errors due to frequent lack of formal data schemas for the structured data of voluntarily reported events. Given that, both standardised, codified aggregate data and its thorough examination using analysing methods for drilling into granular detail is greatly needed in order to identify event trends accurately and consistently [2].

As methods in risk identification, analysis, and management are more advanced in aviation than in health care, health care could potentially gain from adopting and integrating many important tasks from aviation to reduce errors and to standardise processes [3]. In health care, however, safety issues have got an increasing attention in recent years. Practice guidelines and safety protocols have been announced in order to reduce harm to the patient. In addition, different quality checklists and instruments have been developed, e.g. GTT [4], [5] to identify adverse events and possible hazards in health care.
The flight safety is today based on one word: the procedures, i.e. agreed operations models that create the aviation safety net. At most they are written in manuals telling the crew all the exact procedures, many hundreds of them, with their accurate timing in corresponding situations during a flight [6]. Other well-tried (and often obvious) things, like good airmanship, can also be classed to them. Standard operating procedures are a strong defence against deviations and errors causing harm in the aviation industry. They are in close connection with the culture of an organisation. In the organisations working among high risk, they are results of development processes having required active human participation [7]. However, because of the huge complexity of the procedures and their combinations, deviations do occur, which, as explained before, might cause a series of them leading to fatal consequences. In fact, the failures in following the standard operating procedures have been proved to be the major contributing factor to aviation accidents [7].

Since the beginning of the 1960s, the aviation accident rate has been greatly reduced through systematic safety work [8]. Fundamental to safety management is the principle of collecting and analysing operational data [9]. The data collected in airline industry can roughly be divided into two types: structured data and unstructured, narrative data. With structured data, the explanation of the case usually tells the truth till a certain rate, but completed with narrative data it can reach the level of 100 per cent, at least theoretically. It has been widely estimated that the main part (over 80%) of the information in reporting is written in the unstructured and textual format. This information could contain nuggets of valuable knowledge. The latest studies on aviation suggest that text mining can be utilised to detect “lethal trends” [10], i.e. chains of events that without intervention lead to accidents [11]. Finding and analysing these chains allows focusing on the development of safety practices to critical situations. The purpose of this paper is to apply text mining for identifying lethal trends in patient records and in aviation and to compare and evaluate these trends in the two fields. The goal is to explore if health and aviation records can be evaluated in similar ways. This scheme of things is clearly expressed in the statement of the Chief Medical Officer annual report as follows: “Like the aviation industry, safety must be at the core of our health services if we are to improve patient care” [7].

Health care shares many features with aviation: high safety standards, the importance of communication, multidisciplinary teams, stressful working environment, and high requirements for skills and technology [12], [13]. Like in aviation, also in healthcare errors and system failures action should always follow. The question is always finally of individuals. Each story of failure ends with a real person with a real story [7]. Both sectors belong to the so-called high-risk or safety critical industries, among which the concept safety culture is essential. It originated in practical aspects, being used for the first time in touch with the accident investigation of the Chernobyl disaster to illustrate that the origins of the accidents are not only in technical failures or human errors made by individuals [14]. This concept was presented in order to emphasise that also factors in connection with management, organisation, work community and even the society affect the emergence of accidents [15].