

Chapter 4

Making a Case for Information Integrity in Healthcare

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ABSTRACT

This chapter presents a medical error example, which revolves around the issue regarding the nature of knowledge factors required in healthcare problem solving. Given the open system view of a healthcare system, the error presented here is of not correctly originating important, but less obvious, information requirements of the case. This leads to the loss of Information Origination Integrity, resulting in delivery of unsafe healthcare.

1. A REAL LIFE EXAMPLE: ANESTHETIC ERROR RESULTING IN LOSS OF HEALTHCARE GOAL INTEGRITY

When patients get treated for their ailments, they reasonably expect that their health condition will improve, or, at the least not deteriorate. This is a requirement of goal integrity (Nayar, 2002), between supplier (i.e., healthcare systems and components), process (i.e., treatment) and customer (i.e. patient). Medical literature examines a corpus of cases in anaesthesiology; one is as follows (Cook et al., 1991, 1994).

1.1. Case Description: A Vascular Surgery Inflicting Patient with a Myocardial Infarction

An elderly patient presented with a painful, pulseless, blue arm indicating a blood clot (embolus) in one of the major arteries that threatened loss of that limb. Emergency surgery to perform removal of the clot (embolectomy) was clearly indicated. The patient had a complex medical and surgical history with high blood pressure, diabetes, requiring regular insulin treatment, a prior heart attack, and previous coronary artery bypass surgery. The patient also had evidence of

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recently worsening congestive heart failure, that is, shortness of breath, dyspnea on exertion and leg swelling (pedal edema). Electrocardiogram changes included inverted T waves.

Chest X-ray suggested pulmonary edema. The arterial blood gas showed markedly low oxygen in the arterial blood (paO₂ of 56 on unknown FiO₂). The blood glucose was high (800). The patient received furosemide (a diuretic) and 12 units of insulin in the emergency room. The patient was taken to the operating room for removal of the clot under local anesthesia with sedation provided by the anesthetist. In the operating room the patient's blood pressure was high, 210/120; a nitroglycerin drip was started and increased in an effort to reduce the blood pressure.

The arterial oxygen saturation (SaO₂) was 88% on nasal cannula and did not improve with a rebreathing mask, but rose to the high 90s when the anesthesia machine circuit was used to supply 100% oxygen by mask. The patient did not complain of chest pain but did complain of abdominal pain and received morphine. Urine output was high in the operating room. The blood pressure continued about 200/100. Nifedipine was given sublingually and the pressure fell over 10 minutes to 90 systolic. The nitroglycerin infusion rate was decreased and the pressure rose to 140. The embolectomy was successful. Post-operative cardiac enzyme studies showed a peak about 12 hours after the surgical procedure, indicating that the patient had suffered a myocardial infarction (heart attack) sometime in the period including the time in the emergency room and the operating room. The patient survived.

2. LOSS OF INFORMATION INTEGRITY

What went wrong? Was it the error in medical prescription first by the physicians who saw the patient initially, and then by the anesthetist or error in surgical procedure or in procedures pursued

by the anesthetist? Or was the error due to lack of skill on the part of participants? All these are post-event observations. In the peer review that followed after the incident it was apparent that many of the practitioner's actions were appropriate in the context of the case as it evolved. For example, the level of oxygen in the blood was low and the anesthetist pursued several different means of increasing the blood oxygen level, including the use of oxygen by mask.

What really went wrong is all through the course of the vascular surgical treatment the practitioner assumed patient's intravascular volume as "high" as already validated for patients with high signs of congestive heart failure and the information processing operative in the context was not geared to anticipate information error, i.e., loss of Information Integrity (I*I) (Mandke et al., 2002).

3. INFORMATION ORIENTATION ERRORS AND LOSS OF INFORMATION INTEGRITY

Error here is of not *originating* correctly less obvious but more important, information requirements of the case (Bogner et al., 1994; Cook et al., 1991, 1994).

3.1. Resulting in Loss of Healthcare Information Content Integrity and Healthcare Goal Integrity at Physician Level

High increased intravascular volume is often present in patients with signs of congestive heart failure. In this case, condition of congestive heart failure was present with other (system environmental) factors including those of high blood glucose and the prior treatment with a diuretic. This indicated that *the* patient's intravascular volume is "low." The fact that the blood pressure fell much further than intended was probably the result of depleted intravascular volume, which

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