By-scouts must not die: three accounts of Lewis's tragedy and their implications for prevention

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The events leading to Lewis's tragic loss can be read through different frames of reference. Here I briefly compare and contrast the understanding and ramifications produced by the domino (DM), the Swiss cheese (SCM) and the functional resonance (FRM) models.

Starting from harm, the DM analyzes events backward until something wrong is encountered. The central idea is that when an important component breaks, inevitably everything else follows, collapsing and sometimes harming. The search for the single cause usually stops next to a healthcare provider because of his proximity in space and time to the adverse event. In Lewis's case, the DM would probably identify the problematic chief resident, as the distinct cause shattering a supposedly well designed and functioning system. This provider failed to accurately monitor Lewis's vital signs; to request help of senior physicians; to interact heedfully with his colleagues; and to listen respectfully and collaborate with Lewis's mother. The resident also failed as a clinician, being unable to make sense of his patient's signs and symptoms even after the emergence of a typical set of manifestations due to a perforated gastric ulcer. He did not escalate the response, did not order crucial lab tests (eg, white cell counts), non-invasive diagnostic-imaging tests (eg, abdominal CT scan) and invasive diagnostic procedures (eg, gastroscopy).

The SCM proposes that a set of factors pertaining to the sharp end (eg, unsafe acts and poor communication), and blunt end (eg, ineffective strategies and modest management), combine and align resulting in an adverse event. In other words, a linear cause-effect chain of identifiable human and organizational causes is sufficient and necessary to bring about harm. In Lewis's case, the SCM most likely would also identify the chief resident, as one of the causes that crushed a well designed and functioning system. Still at the operational level, it would, for example, point to miscommunication between residents and nurses; inadequate supervision from distance of junior physicians; lack of standardized handoff from PACU to ward; and poor planning of postoperative care. In addition, the list of flaws would include managerial defects, such as weak strategic planning ignoring patient safety; overlooking information technology as a key source of support for clinicians; and disregarding transparency and accountability as core values for the whole organization. Following the logic of the SCM, Lewis's death is attributable to a straightforward combination of causal links culminating in a disaster.

Both the DM and the SCM represent linear models and focus on organizational structures and individuals. The first one singles out an isolated cause, whereas the second one identifies a set of causes acting in sequence. Investigations based on linear models vary in terms of depth and thoroughness, based on who is involved, and often stop when it is politically expedient. The main thrust is to point to a cause, socially credible and politically instrumental, not to reach an explanation. As a result, these models easily lead to blame and shame of rather powerless actors, more training and the adoption of additional rules. Assigning blame to an individual at the front end reassures internal and external stakeholders that at last justice has been achieved; a lesson has been thought to other providers who might get distracted or are not proficient enough; and necessary steps to prevent similar events have been adopted. The belief is that comparable errors will not be repeated and analogous adverse events will not occur again. Now that the cause is clear and the culprit has been reprimanded and isolated, the normal course of things can begin again. In Lewis's case, the resident would probably be demoted or removed, such decision

would be publicly announced, and external stakeholders would be reassured that the only or main cause of a disaster was eliminated. In fact, the poor clinical performance of the resident would have been easily recovered by a system of care characterized by open communication, mindful interactions between providers, and close supervision from distance. Furthermore, new rules, for example concerning the availability of senior physicians during the weekends and standardization of postoperative care would be designed. However, these approaches would leave the hospital staff without an explanation about why and how Lewis died, and work-as-done would remain untouched.

The FRM looks instead at functions, their interdependencies, tight couplings and potential for functional variability. The FRM does not look for causes. Instead it produces deep understanding of variability within non-linear socio-technical systems, ie how things happen and what might happen. In Lewis's case, FR would contend that the outputs of several critical functions related to his care displayed unwanted variability that spread through tight couplings to other essential functions up to a point where the system of care broke down. Examples of amplified variability in outputs include the following: the surgical procedure lasted much longer than planned (too late), increasing surgical stress; staff in PACU (Post Anesthesia Care Unit) prescribed a pain killer inappropriate for patients under 18 yrs (wrong analgesic), did not ensure that Lewis received enough intravenous fluids (too little fluids, too late), nor anticipated possible complications and adverse events (omission); lack of CPOE (Computerized Provider Order Entry) did not warn clinicians about the wrong selection of the pain killer (omission); the handover between PACU and oncology unit was inaccurate (imprecision), and ward staff were not proficient in postoperative care (imprecision). These, together with many other short lived circumstances, contributed to the emergence of high variability and led to functional resonance of the care system. In other words, the variability of the outputs of numerous functions added force to each other, ending with the death of Lewis.

In Lewis's case, FRM would suggest several strategies that might contribute to dampen unwanted variability in postoperative care. Such recommendations would be based on the analysis of work-as-done through interviews and observations of healthcare providers delivering clinical services in the hospital that cared for Lewis. The FRAM model in the annex represents a possible illustration of how to redesign the overall system of postoperative care in order to reduce variability due to factors internal or external to functions, and functional upstream-downstream coupling. The representation identifies twenty critical functions: three (gray color) belong to management, sixteen pertain to clinical care and one-learning (green color) relates to both management and clinical care. Within the clinical care functions, five (yellow) concern care delivered in the operating room up to when the patient is handed over to the ward; five (purple) have to do with communication and collaboration among clinicians and between providers and patient/family members; three (red) relate to monitoring of patient's conditions, and three (blue) involve the response to emerging signs and symptoms. More detailed representations of the postoperative care system would allow a better understanding of how critical functions might be improved through learning from previous adverse events, anticipation of plausible scenarios, skilled monitoring, and rapid and strong response to small signals of clinical deterioration and heedless interactions. The lines connecting the functions show potential tight couplings, that will hopefully bring about desirable variability and resourceful adaptation, instead of brittleness and instability.

In summary, the three models offer very different accounts of what, who, how and why contributed to Lewis's death. These approaches do not merely represent different endeavors to describe and explain an unrecoverable disaster, but, above all,

imply drastic different responses to prevent similar events. The DM and the SCM dissect systems into parts; offer first stories without an explanation, ie mere descriptions of events, that come immediately into view, and inevitably hinder learning. They arbitrarily assign causation to a single factor or a linear sequence of multiple factors, respectively. The DM would suggest that a bad apple at the sharp end, ie the chief resident, is the single root cause behind Lewis's loss and the simplistic and ineffective solution is to blame, shame, punish, and retrain, maybe expel him. The SCM would see Lewis's death as the effect of an unforeseeable sequence of a number of latent conditions and unsafe acts that occurred in a specific order where no single factor was enough to trigger a substantial breakdown. The SCM's advice would be to identify and remove defective elements and build barriers protecting the system from such faulty components. The FRM postulates that work-as-done is a dynamic phenomenon made of multiple and confusing events often evolving in rapid progression. Work-as-done is very different from work-as-imagined. Based on a profound understanding of work-as-done, FRM offers multiple and pragmatic solutions to the improvement of complex systems through better monitoring and management of performance variability.