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**New institutional setting, new organizational configurations:
Redesigning the Danish emergency care system via a contingency approach**

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- Work-in-progress, research paper-

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1. Introduction

As a result of major administrative reform in 2007, the Danish emergency care system is undergoing the largest reorganization in decades (MHP, 2008; Vrangbaek, 2013). The number of acute hospitals has been reduced from more than 40 to 21 and new emergency departments (EDs) have been established (MHP, 2008; Wen et al., 2013, Mattsson, Mattsson & Jørsboe, 2014). The EDs are the cornerstones of the Danish National Health System (NHS), as up to 70% of all acute care patients are evaluated there; they can be treated and discharged, or admitted for further care (MHP, 2008; Wen et al., 2013). The EDs therefore play a crucial role in determining the design of the overall healthcare, being a critical pathway for acute care and addressing hospital crowding.

The Danish emergency care system represents an organizational field (DiMaggio & Powell, 1983) in which highly specialized healthcare actors, such as primary care physicians (PCPs), systems of out-of-hours care clinics, ambulance systems, and hospitals, have to coordinate their actions with the ultimate objective of providing a timely and appropriate response toward the collective. On the other hand, following the general reform of 2007, the National Board of Health in Denmark (NBHD) has recommended the delivery of emergency care through fewer, larger, and more centralized EDs. This was done to concentrate specialties¹ and provide a higher level of care with greater efficiency in a system in which the patients' overall impression of hospitalization has traditionally been positive (MHP, 2008). Moreover, the overall reform generated (external) financial crunches for healthcare providers that predictably turned into internal pressures related to efficiency (e.g., Louis et al., 1999; Lega & DePietro, 2005; Reay & Hinings, 2005, 2009). The search for efficiency through the maximization of economies of scale, by concentrating specialized knowledge and equipment, is generating some symbiotic organizational effects. These can be studied at different levels of analysis (Hackman, 2003): a) at the *macro level*, through a general rationalization of public expense, in two ways: a.1) regions are in charge of the planning and delivery of healthcare, and new regional mechanisms for governance and funding, resulting in the diffusion of new performance appraisal approaches; a.2) positive operational spillovers are exploited amongst agents through coordination mechanisms based on healthcare networks, with several interdependent providers covering the various phases of emergency care;² b) at the *meso level*, via the definition of structures, roles, and procedures of emergency care. In essence, each

¹ Emergency medicine encompasses a large amount of general medicine but involves the technical and cognitive aspects of virtually all fields of medicine and surgery. To date, unlike other countries, emergency medicine has not been a formally recognized specialty in Denmark.

² Initial stabilization, triage/management, diagnosis, and disposition of individuals with acute illness and injury.

hospital designs its own ED, with different levels of managerial autonomy, human resource specialization, technological endowment, and design of internal processes. In short, the Danish emergency care system is trying to change toward a more cost-effective but also a more patient-oriented configuration; c) at the *micro level*, via the design of appropriate incentives for professionals. In Fearlie and Shortell's (2001) terms, "A multilevel approach to change and the associated core properties can provide a framework for assessing progress on these and related issues over the next several years" (p. 307).

This paper presents the preliminary results of a larger research project called DESIGN-EM,³ aimed at designing effective and efficient EDs. In a dynamic environment, in which each of the 21 Danish hospitals is still configuring its own ED,⁴ this research project aims to determine if differences in organization designs affect efficiency, effectiveness, the quality of patient care, and resource utilization. It reports on the part of the project attempting to investigate the meso level of analysis (hospitals/EDs), and focuses on the research gap related to the adoption of the multi-contingency approach (Burton & Obel, 1988, 2004) in the design of emergency care, with a specific focus on the EDs (Table 1). Thus, this research addresses the following research question: *How can hospitals design their EDs to adapt to institutional, technological, and clinical dynamics?*

The paper is structured as follows: Section 2 illustrates the theoretical background, both on the organization design of EDs and the contingency approach; Section 3 describes the research model; Section 4 reports some preliminary results; the discussion and conclusion are in Section 5.

2. Theoretical Background

The Danish NHS is a highly regulated public sector, with the central government and the five regions playing the dual roles of payer and regulator (Ferlie & Shortell, 2001; MHP, 2008; Vrangbaek, 2013) (Table 1). As in many other institutional settings, the top-down impulse toward redesigning the EDs might be mediated by the existence of logistic barriers (layout of the buildings), the interests of professional groups, and the status quo (Scott et al., 2000; Battilana & Casciaro, 2012), a diverse cognitive imprinting that characterizes the professional communities involved (Reay & Hinings, 2005, 2009).

Despite the vast amount of literature on the subject of emergency care, few works have concentrated on the design of EDs. Some of them have addressed specific issues, such as

³ Research Network for Organization Design and Emergency Medicine. Available from <http://icoa.au.dk/research/design-em/>

⁴ For the same hospital, the configuration of the ED might change during the day (see Table 2: night, evening, daytime).

crowding (Asplin et al., 2003), whereas others classify them in terms of their functional characteristics, i.e., the case mix (Cameron, Baraff & Sekhon, 1990). Wen et al. (2013) recently conducted a survey on the Danish emergency system, using data from 2008, and classify the EDs in terms of the ages of patients (all ages/adults/children), and contiguity between the ED and other departments (contiguous/non-contiguous). Mattsson, Mattsson and Jørsboe (2014) investigated the effect of physical layout and managerial autonomy on quality. The DESIGN-EM project is based on the assumption that a) the organization design of EDs has to be inspired by a process-oriented approach, and b) that the contingency theory of organization design can provide an effective framework both for understanding the extant setting and for designing future EDs. The consideration of the whole, in terms of comprehensive patient pathways, fits the definition of emergency medicine itself, being oriented to the stabilization and the final disposition (discharge/admission to hospital) of individuals with acute illness and injury. The consideration of the process orientation in designing EDs could therefore overcome the dominant logic of professionalism (Lega & DePietro, 2005; Reay & Hinings, 2005, 2009; Battilana & Casciaro, 2012), converging toward a higher level of efficiency (Vera & Kuntz, 2007; Kaplan & Porter, 2011; Vos et al., 2011), or goal-oriented patient care (Porter & Teisberg, 2007; Reuben & Tinetti, 2012; Vos et al., 2007), promoting integrated delivery systems (Lega, 2007; Villa, Barbieri & Lega, 2009; Welch, 2012), and delivering care of a higher level of quality (Donabedian, 1988; Graf et al., 2002; Porter, 2010; Nenni & Giustiniano, 2013).

The adoption of contingency theory relates to the assumption that organizational efficiency and effectiveness are largely determined by organization design, meant as the design of structures and processes (Burton & Obel, 1988, 2004). Based on the information-processing perspective (Galbraith, 1974), the multi-contingency model for strategic organizational design developed by Burton and Obel (1988) is a set of “if-then” misfit rules, in which misfits lead to a loss in performance (Burton, Obel & Lauridsen, 2002) (Fig. 1). The contingency design of EDs is sufficiently robust to permit the adoption of triangulation, meant as “what is,” “what might be,” and “what should be” (Burton & Obel, 2011). The parts of the model (Fig. 1) requiring major reconsideration are: environment (complexity, uncertainty, and equivocality), strategy (exploitation vs. exploration; diversity) and structural configurations.

[Fig. 1 about here]

3. Research Model

The contingency theory framework permits the adoption of multiple approaches, which are compatible with the multilevel perspective. For the focus of this paper (meso level), the unit of analysis is the ED; in the Danish system, this is active in a wider regional emergency system, embedded in one hospital, interacting with other specialties/departments (within the same hospital), and serving one or more municipalities (see Section 4). All the 21 Danish EDs are involved in the research project, which therefore covers the whole universe.

Similarly to other studies (e.g., Carroll et al., 2006; Lin et al., 2006; Cardinal et al., 2011), the quest to determine what the organization design of ED “should be” is determined through the assessment of “what is (are)” the current practice(s), and the examination of other “what might be” conditions. The “what is” aspect describes and explains the current organizational settings, here based on five semi-structured interviews per hospital, conducted by two PhD students (healthcare and management, with medical and anthropological backgrounds).⁵ The interviews are taped and transcribed verbatim. Additional archival data are also being collected for each hospital.

The examination of variations and alternatives, and the exploration of possibilities and boundaries are based on two “what might be” approaches:

- A computer simulation undertaken through OrgCon (9.1), an expert system of design rules, widely used in the field of contingency-based organization design (e.g., Burton & Obel, 2004; Carroll et al., 2006). For each of the 21 EDs, the software releases a diagnostic report on the situational and contingency misfits;⁶
- A quantitative analysis based on a rule-based contingency misfit model and related hypotheses to be tested empirically. The dependent variable is a measure of quality/effectiveness (e.g., seven-day mortality, re-admissions, length of stay), whereas the independent variables are represented by the sets of possible misfits (e.g., Burton, Lauridsen & Obel, 2002);⁷

The triangulation of the approaches described could result in a better understanding of the underlying phenomena and greater confidence in the design solutions recommended, as well as a concrete judgment on what “should be.”

4. Preliminary Results

⁵ Interviewees: CEOs, ED leader(s), physicians, nurses and secretaries. Expected end: March 2015.

⁶ Expected end: March 2015.

⁷ Expected end: September 2015.

As anticipated, this paper reports the initial results of the DESIGN-EM, a work in progress related to the meso level of analysis, namely the organization design of Danish EDs for the 21 extant hospitals. Considering the methodology and the state of the art described in Section 3, three main research outcomes⁸ have been achieved: 1) the definition of the organizational field; 2) the identification of the extant structural configurations for EDs (specific to the Danish context); 3) the translation and the interpretation of the general contingency variables within the specific field of emergency care.⁹⁻¹⁰

4.1. The organizational field

Following DiMaggio and Powell (1983), the Danish emergency care system can be analyzed as an organizational structure made up of “those organizations that, in aggregate, constitute a recognized area of institutional life” (p. 148). Taking into consideration the extension to healthcare made by Reay and Hinings (2005, 2009), Table 1 shows the reconstruction of the Danish emergency care system.

[Table 1 about here]

As with the whole DESIGN-EM project, this paper follows DiMaggio and Powell (1983) when they state that “The structure of an organizational field cannot be determined a priori but must be defined on the basis of empirical investigation. Fields only exist to the extent that they are institutionally defined” (p. 149). Thus, the first outcome of the paper is the understanding of the Danish emergency care system, with particular attention paid to its structure in terms of “structural equivalence” and “connectedness” (DiMaggio & Powell, 1983, p. 149).

Danish hospitals can be considered as *structurally equivalent* in relation to the (single) region to which they belong, which plays a *role* in the planning, financing, and coordination of their activities (see Table 1). Each hospital runs one ED, although the ED itself could be split into several emergency rooms in different internal specialty-based departments (see later, the “embedded model”). The 21 EDs are substantively independent, ambulance/patient deviation being an extremely rare phenomenon.

⁸ WOA deadline for short papers: 31 March 2015.

⁹ Note for to the WOA Track chairs/reviewers: Considering the maximum length allowed for this short paper, the results of point 3) could be described only in a longer version of the paper.

¹⁰ As indicated in Section 3, the interviews must be completed by March 2015; the simulations will end around April 2015.

DiMaggio and Powell (1983) define *connectedness* as “the existence of transactions tying organizations to one other” (p. 149). The Danish emergency care system is made up of connected actors, which perform their activities according to the input-throughput-output (Asplin et al., 2003) scheme depicted in Fig. 2.

[Fig. 2 about here]

4.2 Structural configurations

Studies on the subject distinguish structural configurations in terms of the concentration of homogeneous skills (e.g., between “functional” vs. “process-oriented” skills, Porter & Teisberg, 2007; Vos et al., 2011; Reuben & Tinetti, 2012; Welch, 2012), or in terms of the physical layout of spaces (e.g., independent vs. contiguous ED, Wen et al., 2013). At first glance, each of the 21 EDs has its own configuration given the total autonomy the hospitals had in their design. The analysis conducted thus far has permitted the identification of four main structural configurations (Fig. 3 and Table 2).

[Fig. 3 about here]

[Table 2 about here]

In “independent” EDs, all the actors in emergency care are strongly connected to one another and are only weakly connected to other organizations (e.g. Giustiniano & Bolici, 2012), representing what DiMaggio and Powell (1983) label a *clique* (p. 149), also having a more central role in the relevant “referral networks” (Mascia, Angeli & Di Vincenzo, 2013).

5. Discussion and Conclusion

Despite being a work in progress, the study suggests that there is no single best way of designing EDs. Rather, each configuration has to be compliant with the institutional pillars of the Danish NHS and responsive to the needs of the areas and community in which it operates. The evidence shows that the design of EDs should fit the socio-demographic conditions of the areas, the physical layout of the spaces, the availability of human and technological resources, and interdependencies with other departments/specialty.

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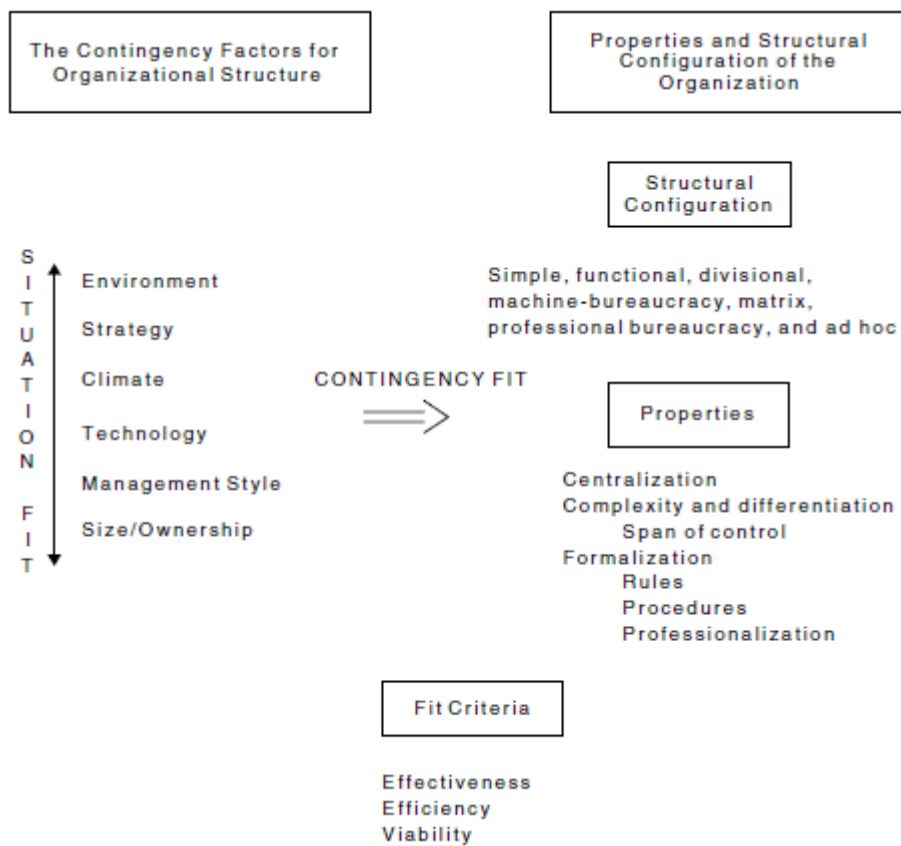
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Table 1 – The Danish Health System as an organizational field

Role played in the organizational field	Actors/organizations/institutions of the Danish NHS	Roles in the Danish emergency care system
Suppliers	Hospitals, private clinics, day care units.	21 emergency departments (EDs), which are internal departments (or sub-departmental units) of public hospitals They are all internal departments but one is a sub unit of another department)
Resource and product consumers	Resident population	Residents with emergency needs (98 Municipalities) – population of around 5 Million inhabitant
Regulatory agencies	Danish National Government (Ministry for the Interior and the Health, the Danish Health and Medicines Authority – DHMA, The Danish Healthcare Quality Program - DDKM)): the government sets the regulatory framework of health services, in charge of planning and supervision. Regions (5), responsible for planning and delivery of specialized health services; they own, manage and finance hospitals and finance the majority of services delivered by PCP, office-based specialists, etc. Municipalities (98), responsible for nursing homes, home nurses, etc. NGOs (Doctors' Association, Danish Red Cross, Danish Refugee Aid).	The Regions plan and finance the regional emergency system, based on national guidelines The 98 municipalities provide nursing home care (note: a single ED might serve more than one municipality)
Other organizations that produce similar services or products	Private VHI (voluntary health insurance), but none of the private clinics or hospitals provide emergency care	

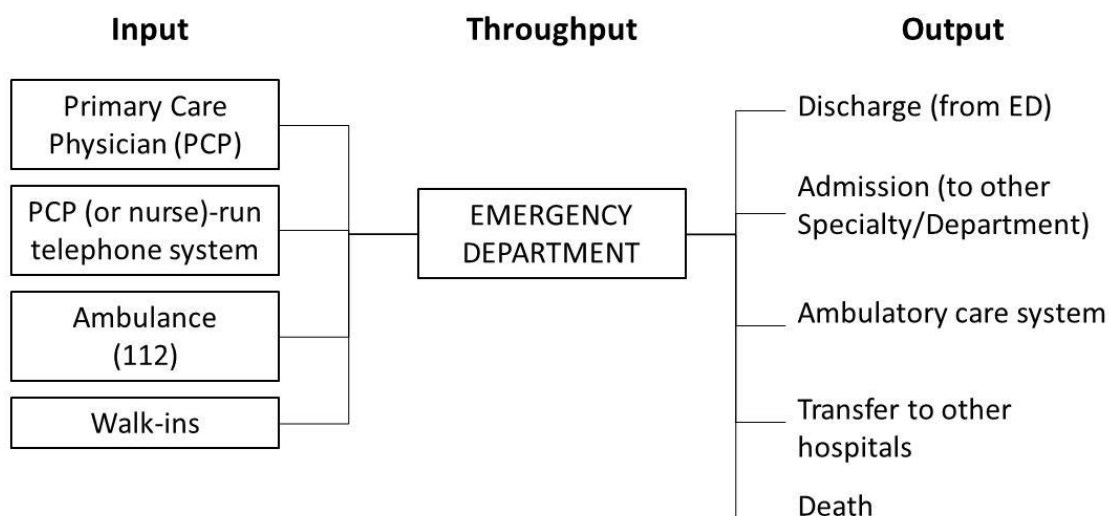
Sources: Adapted from Vrangbaek (2013), MHP (2008).

Figure 1 – The multi-contingency model of organization theory



Source: Burton, Laudidsen & Obel (2002: 1463).

Figure 2 - Description of the overall emergency care process in the Danish NHS.



Sources: Adapted from Cameron, Braff & Sekhon, (1990), Asplin et al. (2003); Welch (2012); Wen et al. 2013.

Figure 3 - Structural configurations of the Danish EDs

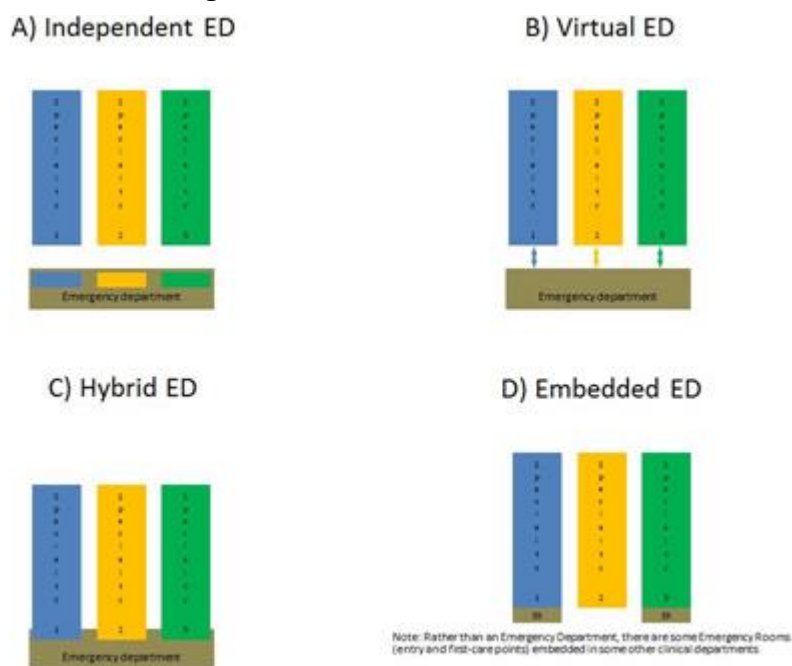


Table 2 – Characteristics of the ED structural configurations

Structural configuration	Characteristics	Configuration typology and impact on contingency fits	Hospital
A) INDEPENDENT	A complex structure (gathering several specialties), that might be based on multidisciplinary teams (clinical skills match the process). It is characterized by “contiguity” of layout (medical and surgical care are provided in one area). It embeds smaller specialized units (trauma center, stroke center) and or dedicated labs (units are grouped with care requirements). It manages the whole emergency process, from Patient arrival to departure from ED Human resources are employed by the ED or available on a regular and predictable basis. It might have “intake areas”, “ED treatment rooms”, “fast tracks” (clinical pathways) and “clinical decision units”, “patient segmentation”. Patients terminate their stay in three days, after that they are discharged or transferred to other departments.	<i>Divisional</i> The ED is designed as a Divisional Unit (aggregation criteria is the “state of emergency”). In our study, Independent EDs are able to manage the most part of the emergency processes and patients are either discharged or admitted to other departments. So, except for specific consultancies by some specialists (operating in other department, e.g. oncology), or the linear interdependence with the receiving departments when patients are transferred, the relations with the other parts of the hospital are very limited.	• Hospital Unit West, Herning
B) VIRTUAL	ED has only nurses and administrative staff as permanent employees. Physicians are on ward in other (functional) departments and operate on call.	<i>Functional</i> ED is a functional unit in a larger functional structure (hospital). “Contiguity” of layout is critical for the provision of care services. It relies significantly on the human resources of the other departments. In any case, the complexity of the Internal environment they interact with is higher than the one of independent EDs.	• Aarhus University Hospital, Noerrebrogade • Bispebjerg Hospital (evening & night) • Regional Hospital of Randers (night) • Regional Hospital Horsens (night) • Hospital Unit Midt, Viborg (night) • Aalborg University Hospital (night) • Thisted Hospital (night) • Hjoering Hospital (night) • Hvidovre, Hospital (night) • Herlev Hospital (night) • Hilleroed, hospital (night)
C) HYBRID	Intermediate solution between A) and B). It might have a contiguous or non-contiguous layout. The ED employs both nurses and some specialized physicians. Other physicians on regular shift (and turnover) at the ED.	<i>Matrix</i> Matrix structure, in which the head of ED coordinates both internal and external human resources. In any case, the complexity of the internal environment is higher than the independent configuration and lower than the virtual one.	• Regional Hospital of Randers (daytime) • Regional Hospital Horsens (daytime) • Hospital Unit Midt, Viborg (daytime) • Aalborg University Hospital (daytime) • Thisted Hospital (daytime) • Hjoering Hospital (daytime) • Bispebjerg Hospital (daytime) • Hvidovre, Hospital (daytime) • Herlev Hospital (daytime) • Hilleroed, hospital (daytime & evening)
D) EMBEDDED	The ED (or just Emergency Room/Unit) operates under other departments. It relies mostly on the human and technological resources of the hosting departments. Specialists from other departments are called when needed (on call, or on ward).	<i>Functional</i> The ED is made of one (or more) a sub-function(s) within one (or more) functional department(s) (e.g. orthopedic surgery, cardiology). The same hospital might have more than one EDs, embedded in different Departments.	• Bornholm Hospital