UNIVERSITY OF CAMBRIDGE
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CONSTRUCTION ENGINEERING MASTERS DISSERTATION ABSTRACT

Cybersecurity Risk in Healthcare Exploratory Research of Hospital Building Services

Human error and the vulnerability of clinical devices are perceived as the foremost cybersecurity risks in the critical infrastructure sector of Healthcare; this limited view, however, overlooks the Building Services that maintain the environment within a facility. Operational Technology not only increases the number of entry points for a hacker but is especially vulnerable as the protocols implemented were never designed to securely connect to the Internet.

Exploratory research began with an Internet search for building service controllers associated with healthcare facilities. Several devices, key to the control of temperature and humidity within a hospital, were found with known vulnerabilities. This affirmed the research question: Can Building Services pose a cybersecurity risk to Healthcare?

Operating theatres, laboratories, pharmacies, sterile stores and imaging equipment have stringent environmental requirements. To achieve these conditions, chilled water and ventilation must function within set tolerances; any divergence could significantly impact a hospital due to cancelled surgeries or diagnostic procedures, an MRI quench or the need to dispose of sterile products. Focussing on the systems required to maintain the environment within these specialist rooms, each element of the cyber-attack process – vulnerabilities, threats, risks and impacts - is investigated using peer-reviewed literature and documentation from four case study hospitals.

To minimise the disruption a cyber-attack targeting the chilled water or ventilation systems could cause, several recommendations, regarding construction contracts, procurement, design and documentation are proposed. As this research only explored a subset of the building services installed in the four hospitals, many other systems, critical to patient health, remain to be examined in the future; these additional investigations would add to this body of knowledge by providing organisations with further examples on which to prioritise a cybersecurity risk management strategy.

KEYWORDS: *Cybersecurity, Risk, Hospital, Building Services, Systems, Chilled Water, Relative Humidity*

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