Topic B14: Policy, standards & regulations

The South African legislative environment, in critical need of scientific evidence based alignment for airborne control.

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Keywords: Tuberculosis, legislation, health, regulations, airborne

SUMMARY:

Review of evidence based research indicates that there are best practice principles that can be applied to the design of the built environment with regard to the reduction of the risk of cross infection from airborne diseases in health facilities. However, analysis of South African building legislation and regulations specific to airborne control and the built environment has identified that there are a number of legislated regulations that are contrary to these best practice design principles. A data matrix was compiled after comparing research of peer reviewed articles, Government gazettes, International and South African health guidelines and South African National Standards for buildings against the current South African legislation and regulations specific to airborne control and the built environment. The aim to identify the building legislation that does not satisfy known scientific peer review published data and evidence base research on airborne contamination and to stimulate a process of amendment to the regulations.

INTRODUCTION

Infectious airborne diseases (viruses, bacteria and fungi) are, throughout the world, an increasing threat to individual health especially within the health facility environments. In South Africa this is particularly the case where infectious airborne diseases are responsible, directly and indirectly, for a large portion of illness and death in hospitalized patients including those patients that are discharged.. While nosocomial airborne diseases such as Staphylococci, pseudomonads, an Escherichia coli, nosocomial pneumonia (Weinstein 1998) pose a threat in hospitals as resistance to drug therapy grows, the airborne disease *Mycobacterium tuberculosis* (TB) poses the major challenge within the health services of South Africa where TB has reached epidemic proportions.

"South Africa has the highest TB incidence in Africa with nearly 500,000 new TB cases each year and is ranked globally among the top 3 in TB incidence prevalence and mortality."(CDC, NDOH, NHLS, MRC 2012)

The poor and vulnerable are particularly affected and co infection rates between TB and the human immunodeficiency virus (HIV) patients is high. Approximately 66% of patients with TB are also HIV positive (CDC et al). Cases of drug-susceptible, MDR, and extensively drug-resistant TB, fuelled by HIV infection, have led to "high rates of morbidity and mortality and can be linked to the absence or limited application of airborne infection-control strategies in both resource-rich and resource-limited settings." (Shenoi, Roderick, Escombe,Friedland, 2010)The slow progress in multi-drug resistance TB (MDR) case detection and treatment

access continues such that control of the disease raises questions of "how to ensure balance of individual rights and liberties: protecting the rights of patients and those who are at risk of infection" (WHO 2012).

This is particularly relevant with regard to health Infrastructure as it is within the closed environment, especially in public facilities where large numbers of people congregate, that the risk of infection through airborne means is greatest. The existing public health facilities within South Africa have had to accommodate unanticipated growing numbers of TB patients which has led to overcrowding of the already poorly equipped health facilities. Un-infected patients attend health facilities where they sit alongside patients with undiagnosed TB or even patients with TB in environments where the risk of cross infection is high not only for the patients but also the staff.

While the emphasis in South Africa on Primary Health Care has seen a shift in health care away from hospital care to outpatient care in the communities at clinics and community health centres, the result is that the hospitals are now comprised of patients who are generally sicker and therefore more vulnerable to nosocomial infections which "typically affect patients who are immune compromised because of age, underlying diseases, HIV or medical or surgical treatments." (Weinstein 1998)

In order to reduce the threat of airborne infection in health facilities, it is important that strategies are put in places that interfere with the successful transmission of airborne infection from its source to a secondary host. These strategies include managerial as well as environmental solutions. It is essential that planning of health facilities promotes the design of spaces that reduce the danger of the cross infection and ultimately reduce the chances of contracting an airborne infection.

"Factors such as temperature, humidity (both relative and absolute), sunlight (ultraviolet light) exposure and even atmospheric pollutants can all act to inactivate free-floating, airborne infectious organisms."(Tang 2009) This can be assisted by dilution of the pathogens in the air through building designs that provide adequate ventilation either natural or mechanical or both (hybrid) methods, reducing the threat to patients sharing space with other, undiagnosed infected patients. Further approaches can be the physical separation of diagnosed infected patients into areas (isolation rooms) that are apart from the general spaces where patients congregate.

International and national guidelines exist regarding the environmental control of spaces with regard to reducing the risk of cross infection with airborne infectious agents especially with regard to TB. However, existing South African building regulations, specifically the SANS 10400 and the R158, do not necessarily support these measures suggested in the guidelines and are, in some instances, contrary to the aims and goals of the WHO principles of good practice. If the rights of patients are to be protected then it is essential that the legislative framework regarding the built environment promotes the reduction of the risk of cross infection *and* promotes design that supports an enabling environment for anyone attending or working within a health facility. Identification of inappropriate legislation is necessary in order to create awareness of the deficiencies in the South African legislative framework so that further research and action can be stimulated to effectively correct the discrepancies.

The aim of this ~~dissertation~~ paper is to prove that the current South African legislative framework specific to the built environment, inclusive of building standards, R158, sustainable SANS204 standards and SANS10400, does not fully promote the design of healthcare facilities that adequately address infection control principles specific to airborne infection

The objective of this research is to:

- evaluate the appropriateness of the current legislative framework with regard to the control of airborne infection within the built environment of health facilities and
- to create awareness of the deficiencies that may occur so that further research and action can be stimulated to effectively correct the discrepancies.

Hypothesis:

"Airborne infection can be better controlled by addressing modifications to South African building legislation."

It is possible to believe that once discrepancies and insufficiencies in the South African building legislation are identified through research and solutions put forward (such as hybrid systems for ventilation control) that are cost effective and easily maintainable, then the risks of airborne disease infection can be reduced.

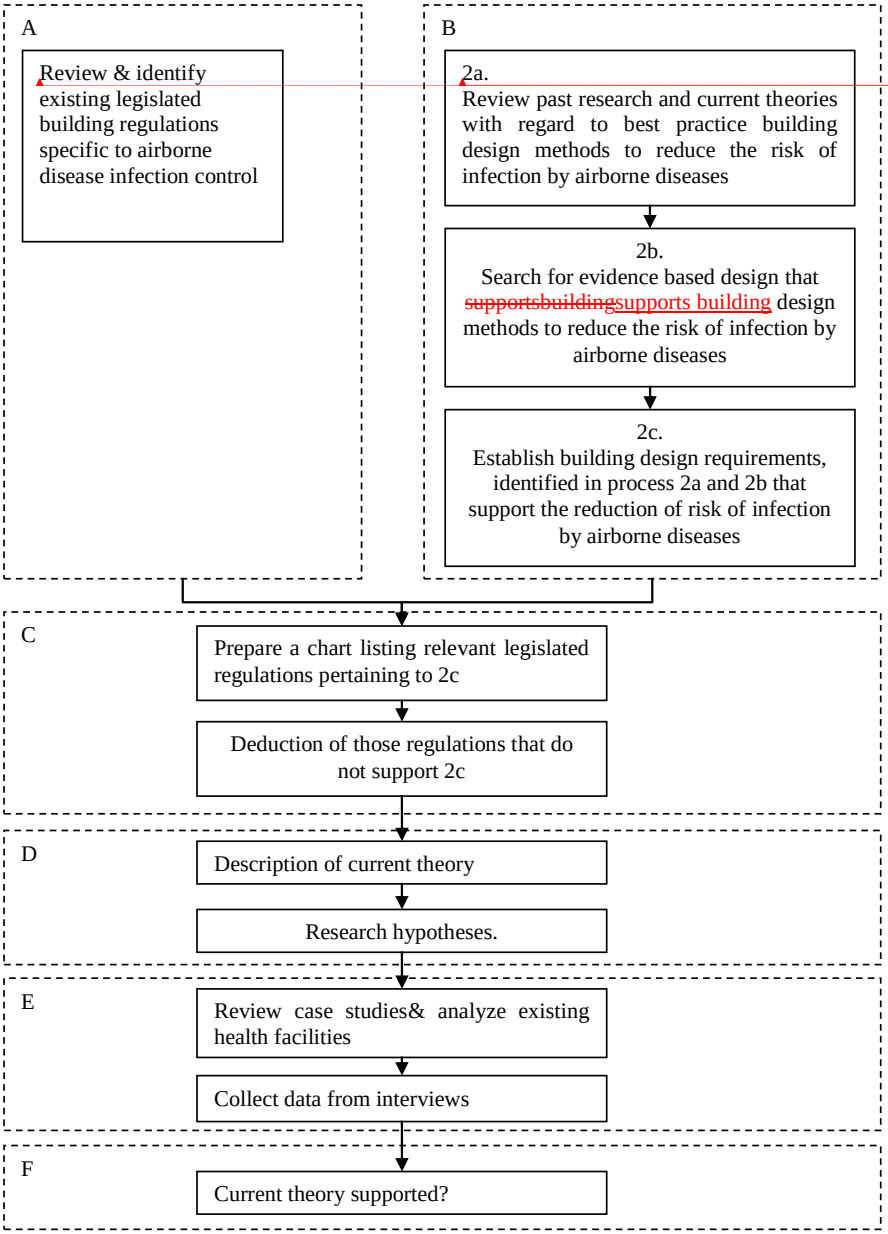
METHODOLOGIES:

To achieve the aims and objectives described above~~, research~~, research for this topic will mainly require:

- Conduct a literature review to define "airborne diseases".
- identify the key building design drivers that contribute towards good infection control principles related to airborne infection within a health facility environment.
- This will require an analysis of available data, including evidence based design and research, in both South Africa and internationally.
- The existing legislation will be assembled to determine those regulations that affect the built environment specifically in relation to airborne infection control measures
- researching literature nationally and internationally to prepare a profile of best practice design requirements with regard to the control of airborne disease infection in health facilities specifically;
- compiling and comparing relevant existing SA building regulations that directly relate to airborne disease and the control of air quality;

It will be necessary to conduct a review of peer reviewed articles, Government gazettes, International and South African health guidelines and South African National standards (SANS) for buildings, South African legislature and regulations specific to airborne control and the built environment. Use a data matrix model composed of established indicators to compare South African and international guidelines which are scientific and evidence based to existing South African legislature, standards, norms and guidelines for airborne infection control.

Figure 2 : Research approach



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RESULTS AND DISCUSSION:

The matrix model indicates shortfalls in existing legislature, guideline, norms and standards in relation to scientific peer review published data on airborne contamination. In addition the current SANS building standards and design guidelines as issued by the South African National Government do not satisfy known scientific peer review published data and evidence base research on airborne contamination.

Preliminary investigation suggests that there are specific legislated building regulations in South Africa that are contrary to the prevention of airborne disease infection in health building design and which actually increase the risk of patients contracting an airborne disease:

- Legislation pertaining to common spaces where patients congregate (I,e, waiting areas) is often inappropriate when applied to regulating air quality in overcrowded spaces. This puts all patients at risk of cross infection especially in spaces where there are people with undiagnosed airborne diseases mingling with HIV patients that are immune compromised;
- The fact that health facilities in South Africa are economically constrained and poorly maintained often leads to systems, such as air conditioning, failing. Regulations do not accommodate this reality and air quality becomes compromised as soon as the system fails due often to the design regulations being implemented that only address air conditioned, fully enclosed spaces;
- Naturally ventilated spaces, for effective airborne infection control, and depending on the ambient climate, may need to have large openings, open at all times, to be effective. Local conditions (cold weather) preclude keeping windows open in winter which leads to poor air quality and higher than acceptable airborne disease particle concentrations in the air with obvious risks to the patients inhabiting the closed off space. Both these issues could be addressed by mixed mode ventilation (mechanical AND natural ventilation) but are not addressed in the regulations;
- Regulations limiting the percentage of openings (size of windows) in relation to the room reduces direct sunlight and air flow, both of which are important in reducing airborne disease particle concentrations in the air within the room;

CONCLUSIONS:

There is no doubt that legislation needs to be continuously updated and revised to remain relevant and appropriate. The health environment is particularly sensitive to changing disease profiles and it is vital that legislation and regulations be reviewed regularly and amended appropriately.

Given the current situation in South Africa where infectious airborne diseases (viruses, bacteria and fungi) significantly contribute to the morbidity and mortality rate in South Africa, it is obvious that health facilities need to be designed such that principles of good cross infection preventative measures are included. To ensure this, legislated regulations that promote a built environment that aims to reduce the risks of cross infection from airborne diseases is essential.

National and international research of current literature indicates that there are best design practises for design of health buildings that adequately address the reduction of risk of airborne disease infection. Anecdotal evidence suggests that these best practices are not adequately addressed in the existing South African building legislative framework and it is anticipated that, in some instances, the legislation actually promotes conditions that increase patients' risk of infection from other patients already infected with airborne diseases. Should this be proven, it is imperative that an awareness of these deficiencies in the South African legislative framework is brought to the attention of the relevant policy makers so that further research and action may be stimulated to effectively correct the discrepancies

Acknowlegements

Assistance provided by: Peta de Jager, Geoff Abbott, Architectural Engineering Unit, 2014 Centre for Scientific and Industrial Research, South Africa

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- The South African Constitution, 1996 [sections 2, 24, 27, 36 and 39], as amended
- The National Health Act of 2003, Act No.61 of 2003, as amended
- The Occupational Health and Safety Act of 1993, Act No. 85 of 1993 [Section 8(1)]
- Government notice R1390 of 27 December 2001 [Hazardous Biological Agents regulation] as promulgated under section 43 of the Occupational Health and Safety Act of 1993
- Government notice R908 of 27 June 2003 [Hazard Analysis Critical Control Point regulation] as promulgated under section 15(1) of the Foodstuffs, Cosmetic and Disinfectants Act of 1972
- The Environmental Conservation Act of 1989, Act No. 73 of 1989
- The Foodstuffs, Cosmetic and Disinfectants Act of 1972, Act No. 45 of 1972
- The Draft National Infection Prevention and Control Policy for TB, MDR and XDR TB, April 2007
- Management of Drug-Resistant Tuberculosis in South Africa Policy Guidelines, June 2007
- Tuberculosis Strategic Plan for South Africa, 2007-2011
- The requirement for controls to minimise the risk of spreading this airborne disease is legislated in the:
    - The Occupational Health and Safety Act of 1993, Act No. 85 of 1993 [
    - The National Department of Health Tuberculosis Strategic Plan for South Africa, 2007-2011,
    - in the Decentralised Management of Multi Drug Resistant TB – a Policy Framework for South Africa

South African building legislation

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- Government Gazette, 2 March 2012, No.35095. Board notice 35 of 2012, the SA Pharmacy Council; Rules Relating To Good Pharmacy Practice – Section 1.2.2.1
- Building regulations and Building Standards Act 103 of 1977, as amended
- SANS 10400:2010, Code of practice for the application of the National Building regulations

South African building practice policy and guidelines

- R158 of 1980 regulations pertaining to Private Hospitals and Unattached Operating Theatres – R198

International legislation, building standards and policies

- AIA (USA), NHS (UK), and Australian Health Facility Guidelines on healthcare building design.
- ASHRAE Standard 62, "Ventilation for acceptable indoor air quality", 1989
- ASHRAE. "HVAC Design Manual for Hospitals and Clinics, 2003", 1989
- CIBSE Applications Manual AM10:1997 "Natural Ventilation in non-domestic buildings", 1998
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