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Green Hospitals in Healthcare Management: A Brief Review

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Abstract : *Climate change is one of the most discussed topics in the recent times. It has been associated with uncontrolled exploitation of energy sources, improper waste management and deficient measures of water conservation. Hospitals rely highly on energy sources such as electricity and water and it is also a major source of toxic and non-toxic waste production.*
Concept of green hospital is very recent which reinforces to achieve positive effects on climate thus going towards greener planet.
This paper discusses about different set of measures for hospital setups to become a green and more healthier hospital.
Keywords: *Climate change, Green hospital, Waste management, Energy efficiency*

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I. Introduction

Hospitals due to the uses of materials and technologies, resource consumption, waste production and its daily constructions and operations, is a significant source of pollution all around the world, and so helps the public health endangering process unintentionally.[1]
Healthcare industry produces more than 3 million tons of waste annually influencing the health of environment adversely.

Healthcare sector has a responsibility of treating population, but it also must maintain the health of environment by proper disposal of medical waste products and approaching a more greener ways of handling the hospitals.[2]

Waste production and disposal methods are the main areas of concern for environmental issues from health sector.[3] Hospitals around the world are facing problems in the process of becoming a sustainable environment, and evidence indicates that developing countries are incurring more barriers in this field. One of the main barriers is the lack of necessary infrastructure in hospitals to handle hospital waste disposal.
The definition of going green included waste reduction and energy and resource conservation.
Green hospital is a debatable topic, but it generally understood as hospitals which is having a system in place for efficient use of water and energy, more use of green products, reduction of waste products, reusability of products more often, greener building design and a healing garden.
Our paper focuses on five different criteria and requirements for achieving an ideal green hospital for healthier planet.

1. Energy efficiency in hospitals

Hospitals are hugely dependant on energy sources as it must operate 24 hours for entire year. Requirement of energy in hospitals are mainly for heating water, temperature and humidity controls for indoor air, lighting, ventilation and numerous clinical processes – with associated significant greenhouse gas emissions.[4]

The health sector can also play an essential part in mitigating the effects of global climate change by taking steps to limit its own significant climate footprint.
According to WHO, In Brazil, for example, hospitals account for 10.6% of the country's total commercial energy consumption.[5] In the United States of America, healthcare buildings are the second most energy-intensive commercial sector buildings; the health sector spends US$ 8.5 billion on energy every year to meet patient needs, and hospitals use about twice as much total energy per square foot as traditional office space.[6,7]

Hospitals can implement many tools to improve energy efficiency while satisfying the energy requirements of these important energy-consuming end-uses. Using combined heat and power (CHP)

technology, for example, facilities can generate onsite electricity and capture waste heat from the generation process as thermal energy. This can double energy efficiency by eliminating losses associated with the grid delivery of electricity.[8]

In Jaipur, India, for example, a 350-bedded central hospital, cut its electric energy use and total energy bill by half between 2005 and 2008 through a series of conservation measures – and by installing solar water heaters and solar lighting to illuminate hospital grounds.[9]

Smaller measures such as switching to compact fluorescent and light-emitting diode (LED) light bulbs, turning thermostats down by just a few degrees in the winter or up a little in the summer, purchasing energy-efficient products, reducing "standby" energy use, and retrofitting buildings to cut energy waste can have a major impact.[10]

Energy efficiency measures are the easiest and most common way, and the most important first step, that hospitals aiming to achieve green hospital tag can take to cut costs, reduce emissions, and improve human and environmental health.

Installation of solar panels for daily uses of lighting is one of most recent way of energy conservation.

2. Green hospital building design

Green building design of hospitals depend on lot of factors such as:

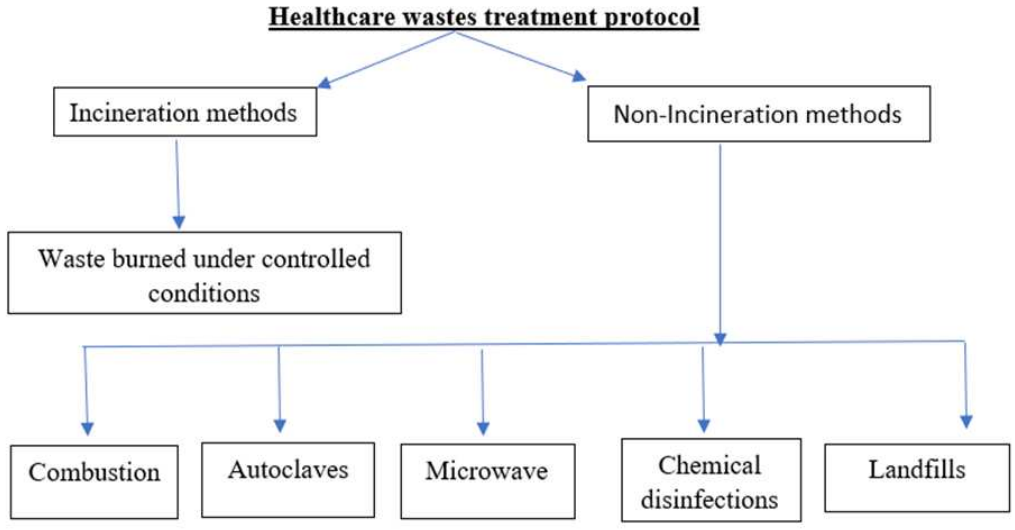
a. Lighting design of the building- Green hospital design should maximize the use of natural light and minimize the uses of artificial light. It can be achieved by using transparent and operable openings to greener courtyards, by installing translucent skylights, using low energy LED lightings. Day lighting has positive effects on patient's well-being. It is a very good source of vitamin D as well.
b. Indoor air quality- it is very important for the health of the patients as well as employees of the hospital. Indoor air quality can be improved by using indoor plants emitting oxygen and reducing pollutants. It can also be improved by using minimal volatile organic releasing compounds in construction.
c. Clear and green interior building materials- Hospitals walls and surfaces should be made to resist the growth of pathogenic bacteria, fungi, and viruses. Nowadays patented interior surfaces are available which prevents the growth of pathogenic organisms such as countertops, vinyl flooring and tiles. Researchers have found copper made materials are resistant to microbes so it can be used during interior designing of the hospital.
d. Garden and landscapes- Gardens and landscape is one of the most esthetic tool of green hospital concept. Plants are considered to infuse positivity and reduce negativity. For example, Sambhavna Trust Clinic in Bhopal, India has building which is designed to create a green environment – literally and figuratively – and includes tropical gardens, a rainwater harvesting system, recycled water for irrigation.[11]

3. Waste management protocol

Very significant amounts of waste are generated by hospital set-ups. To prevent any adverse effect on human health and environment proper management and control procedure for waste should be applied.

Waste management in hospitals is complex. It can be done through different stages such as proper disposal, sorting, reducing and treatment and recycling.

For healthcare waste treatment different technologies are available. Various categories of waste should be treated differently.



Incineration is a method of controlled burning of waste products but in recent scenario of air pollution and release of toxic fumes because of this method makes it highly non-recommendable.
Combustion can be done at minimal, moderate or high heat energy source depending on the waste materials being disposed.

Autoclave is steam heat sterilisation technique which can be done for waste products to be recycled in hospital setups.
Microwave and chemical disinfection protocols which helps in recycling of used materials of the hospitals.
Landfills should be done for the waste products which cannot be reused and cannot be incinerated.

4. Water conservation techniques

Health-care facilities consume vast amounts of water and use energy to heat, pump and dispose of it. Water scarcity in the recent days is being exacerbated by climate change, with its accompanying impacts of drought, glacier melt and aquifer depletion. Health facilities can conserve this precious natural resource by closely monitoring water use, installing water-efficient fixtures and technologies, growing drought-resistant plants, and making sure that leaks are quickly repaired.

To have even more of a conservation impact, hospitals can harvest rainwater and recycle water for non-drinking purposes. At Bhopal's Sambhavna Trust Clinic in India, for example, rainwater is harvested during the monsoon season and stored for use during the dry months of the year; recycled, or grey water is used for irrigation on hospital grounds.[13]

Finally, depending on a hospital's location, potable water may or may not be readily available or plentiful. In areas where potable water is available, health-care facilities can make a tremendous positive impact by eliminating the purchase and sale of bottled water.
Other technique such as onsite sewage treatment plant will filter and recycle captured rainwater and wastewater for re-use in toilet flushing, cooling plant, and interior and exterior garden irrigation.
Fewer hospitals set ups have decided to eliminate bottled water and now uses pitchers of water and re-usable glasses in meetings and conferences.

5. Alternative energy uses

We can cut greenhouse gas emissions and energy costs by using different alternate forms of renewable energy, such as recently promoted solar and wind energy and some biofuels.
Alternative energy sources can be used for lighting, heat generation, and pumping and heating water – which account for a large portion of the energy bill for health facilities in both developed and developing countries. For hospitals, alternative energy means an initial investment with potential savings for future.
At the same time, given its formidable energy demands, the health sector can play an important role in shifting the economies of scale and making alternative energy more economically viable for everyone. For regions that have no access to electricity, alternative energy sources can fuel primary health-care facilities in even the most remote areas.
Finally, alternative sources of energy give health facilities an advantage in terms of disaster preparedness, since alternative energy sources are less vulnerable to disruption than traditional fossil fuel systems.

II. Conclusions

In this modern era of awareness about everything going around in the world especially the effects of climate change, hospitals sustainability depends on going towards greener changes in their setups.
This article focuses very well on different tools to achieve the status of green hospital. These protocols are cumbersome and difficult but not unachievable.

Green hospitals should have staff members who understands the effects of climate change and management should audit, measure, monitor the health practices affecting the climate.
Hospitals should make sure that their buildings are sited to take advantage of microclimate influence such as sun and wind and are built or retrofitted to be well-insulated and energy-efficient and conduct regular energy audits.
Hospital management should focus on different ways to use non-toxic products as less as possible, recycling of used products and proper waste disposal techniques.

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