Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr UGC approved journal no. 63854

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805

Review Article

Ecofriendly Dentistry and Green Hospitals

Avichal Singh Sodhi[1], Harvir Singh Sodhi[2]

[1]Final Year Student, Sardar Patel Post Graduate Institute of Dental and Medical Sciences. Lucknow, Uttar Pradesh, India
[2]Professor and Head, Department of Physiology, Saraswati Medical College, Unnao, Uttar Pradesh, India

ABSTRACT

Eco-friendly dental clinics & hospitals should be environment friendly because it leads to the reduction in pollution thus preserving the environment. The following article is a review on eco-friendly dentistry & green hospitals and the obstacles faced for the same.

Key words: Eco friendly Dentistry, Green Hospitals, Pollution, Hospital Waste, Dental Clinic Waste, Waste Management, Recycle.

Received: 8 February, 2019 Revised: 27 February, 2019 Accepted: 28 February, 2019

Corresponding Author: Dr. Harvir Singh Sodhi, Professor and Head, Department of Physiology, Saraswati Medical College, Unnao, Uttar Pradesh, India

This article may be cited as: Sodhi AS, Sodhi HS. Ecofriendly Dentistry and Green Hospitals. J Adv Med Dent Scie Res 2019;7(5): 52-58.

WHAT IS GREEN DENTISTRY?

The color "green" signifies growth, revival and hope. Green dentistry is a metamorphosis to innovative way of dental practice, in addition to being environment-friendly also leads to conservation of money and time by decreasing waste, saving energy & money, and by reducing pollution with the use of recent techniques and management protocols. Green dentistry, therefore, provides protection to the environment and humanity from the threats of urbanization, chiefly in the developing nations.

INTRODUCTION

It is concluded by different studies that humans are the greatest menace to their own race. Our arrogance towards environment has always affected health and well being of the subjects on a larger scale. Thus, it is crucial for everyone to be aware of the changes and the alteration that can be adopted in lifestyle to minimize the global burden. As per the WHO, there are 11 South Asian nations that produce about 35,000 tons of total health care associated waste every year and approximately 1000 tons daily. The need of hour for the dentists is to become environment friendly and adopt eco-friendly methodologies. [1] The word "eco-friendly dentistry" was introduced by Dr. Malden Kralj, who is the maker of Ora Dental Studio, which is America's first green dental clinic. [2] Worldwide, different organizations have found the requirement to control and screen the dental offices based on the environment. Leadership in Energy and Environmental Design is a rating system that reflects maintainable site development, water saving capacity, efficient energy use, materials selection, and quality of indoor environment.[2] The Eco-Friendly Dentistry Association was launched in June 2009 internationally. The Ministry of Environment and Forests has broadcast Hazardous Wastes Rules in 1989 and revised the same in the year 2000 and 2003 for proper use and handling of the wastes in India. [4] The color "green" signifies renewal, hope and growth. Green dentistry is environment-friendly and conserves money and time by decreasing waste and conserving energy and reducing pollution. Green dentistry, therefore, is important for the protection of the environment and humanity from the hazardous rapid urbanization, in the developing nations. [5]

MANAGEMENT OF WASTE

The biomedical waste is defined as "any waste produced during diagnosis, managing, or immunization of human subjects or animals, or during the research activities associated to with the formation or testing of the biological materials and is categorized in Schedule I of Biomedical Waste rules given in the year 1998." These rules have made it compulsory for the health care Management systems to segregate, disinfect, and dispose all the waste in an environment friendly manner. There is an elevated risk of nosocomial infections amongst patients & heathcare workers alike due to poor waste management protocols. The finest disposal options should be used to prevent or Reduce the disposal of the hazardous substances from the dental clinics into the environment so that it is not harmed.

The World Bank's health‐ care guidelines, have given list of four steps for the management of health-care waste.

1. Segregation
2. Transportation
3. Treatment
4. Final disposal.

The biomedical waste producers should opt for universal precautions and suitable safety instructions while performing the therapeutic and diagnostic procedures. The non chlorinated plastic bags are used for disposal of waste that are incinerable and have the color coding as per the waste disposed in them.

The chemicals produced in dental sector are:

- Dental amalgam
- X-ray fixers
- Lead foils
- Cements having zinc phosphate
- Acids and caustic substances
- Batteries.

Teeth without any restorations or other tissues are disposed directly into the biohazard container, that can be further sterilized. Teeth that have amalgams and could release mercury vapors during the process of sterilization, should be neutralized by disinfection initially, followed by immersion in a solution of a tuberculocidal disinfectant for 30 minutes placed within a sealed container. Items that are heavily soiled with blood should be placed into 'sharps containers'. Used anesthetic ampoules should be kept in 'sharps containers'. Impression compound, dental waxes ,agar, green stick impression material, pastes, base plates should be disposed in "yellow plastic bag" thereafter should be sent for incineration or either deep burial. Rubber based impression substances, investment things, pumice, metal dust, acrylic, alginate, old casts, and models, old acrylic denture bases and teeth should be disposed in a "black plastic bag" and thrown into municipal dump. For waste management protocol refer to figure-1

WASTE REDUCTION

There are four processes that lead to production of waste in dental practice: [6]

(1) Infection control procedures like disposable barriers, sterilization products and toxic disinfectant solutions can endanger health of employee, due to poor quality of office air , and can also lead to pollution of community's water stream. Nontoxic substitutes for infection control and sterilization generally have the same or greater efficiency along with protecting the health and safety of the dental doctors, subjects, and neighborhoods

(2) Conventional x-ray system Conventional radiological rays produce trash and noxious chemical produce that needs to be disposed off. The chemical fixers and lead foils used during x-ray process must go somewhere, which often means public sewage systems. X-ray fixers have chemicals like ammonium thiocyanate and boric anhydride which are allergic to the skin, eye, and respiratory system , and are harmful if ingested. They also produce toxic effects in the blood, kidneys, and liver. Their prolonged exposure can lead to target organ injuries. Lead in the lead foils is a deadly neurotoxin which causes long term health effects. The degradation products are thought to be more toxic than the actual product.

(3) Vacuum systems- Suction machines, also identified as dental vacuums, are a critical part of equipment for dental offices. Unfortunately, they use large amount of water. It is projected that a dental office uses around 57,000 gallons of water every year. Since the world is having a serious water crisis, this water should be poured into the drain directly. Dry vacuum machines have been thought to accomplish the same but with no water use.

(4) Mercury containing dental materials- Amalgam fillings contain some portions of elemental mercury along with a powder that is mainly composed of silver, tin, and copper. Mercury disposed in drinking water, irrigating water, and fishing tanks is a crucial environmental issue and health concern since it is a potent neurotoxin and that devastating long term effects. An amalgam separator should be established that keeps the mercury containing material out of water system

CARDINAL POINTS FOR GREEN DENTISTRY

As per the ballpark quotations given by Environment Protection Agency, the annual turnover of mercury comprising waste is approximately 3.7 tons that forms the deadweight on the waste-water treatment plan, or is incinerated like other trash. Considerable amount of the dental waste formed is around 65% - 75% of dental clinics that uses conventional X-rays that need disposal of around 4.8 million lead foils and approximately 28 million liters of X-ray fixers every year; hence burdening the environment.[7]This burden on environment by dentistry

can be limited by employing the "Four R"s namely, "Re-think, Reduce, Reuse, and Recycle".

Re-Think: 'Go green' Environmentalism, etc. is a state of mind, and crucial for transformation. Rethinking is of prime importance. It consists of re-thinking a plan of downsizing waste which is in accordance with the scenario of eco-friendly dentistry. So far there is no fixed alternative for decreasing the waste produced by the used disposable products,due to which rubber & plastic items have ended up overflowing the landfills.So how can we solve this problem by re-thinking ? Perhaps a person can always place a bulk order to reduce the pollution that is caused via transportation. Manufacturing of the plastic impression trays a uses a large percentage of energy which then sequentially produces havoc in the landfills; which will be a problem for the coming generations.[8] Therefore, single use trays made of corn or stainless steel trays can be cast-off as an alternative. Even with these little baby steps and affordable alternatives can have a remarkable effect on the environment in the long run.

Reduce: The first and foremost step is minimizing the waste that is produced and the clear approach to have plenty of resources & utilize them less . Here are a few measures that we can commonly use in day to day dental practice:

1. Water conservation: Few ways in which the dental office can contribute in saving water are:

- Follow the guidelines given by Centre for Disease Control for hand sanitization and whenever possible use sterilium after washing hands with soap and water and remember to turn off the tap while lathering. [9,10]
- Since, less than 1% of water is regarded fit for consumption by humans, tap should be closed while brushing, as it saves significant amount of water; and the water saved can be utilized for other prospects. Therefore it is the need of the hour to commit oneself to environment in order to spread out consciousness to others.[10]
- Use wet dental vacuum pumps instead of the dry ones in order to save water.[11]
- Maintenance of dental clinic from time to time to check for any leaks .[12]

2. Decrease the uses of disposable items in dentistry as it helps in a long way protecting the environment.[11,12,13]
3. Paperless dentistry should be followed, that consists of using computers and digital technology for creation, use, and storing of office records.
4. Use paper bags whenever required.[12]

Reuse: To re-use signifies to use a product again after it has been initially used once. This action boosts the proper usage of the item; thus stopping the item from going to waste in the landfills thus lessening the excess baggage of waste in the landfills. By using the items again, it relives the natural resources by decreasing the requirement for extractions, along with limiting the amount of energy required for producing the new products.

Some of the ways for reusing in the dental office are:

- Reusable operating room towels instead of disposable plastic drapes,
- Prefer using stainless steel high- volume and low-volume, surgical/endodontic suction tips that can be re used instead of disposable ones,
- Use a reusable glass irrigating syringes instead of disposable plastic syringes
- Biodegradable disposable cups to be used instead of paper & plastic cups
- Whenever possible papers should be re used. The paper that has been used can be shredded and used again wherever required, preferably chlorine-free paper[14]

Recycle: It is the process that converts the waste materials into reusable things. It decreases the exhaustion of potentially spacious materials, fresh raw things, energy usage, air pollution and water pollution(from landfills). Thus decreasing the need of waste disposal systems and decreasing the production of greenhouse gases. [14]

POLLUTION PREVENTION

Webster defined pollution as the adulteration of air, soil, or water by the release of harmful substrates in them. [15] There are different steps that can be taken for the prevention of pollution in the dental office:

1. Steam sterilization- It is time saving and dependable procedure that eradicates toxic chemicals vapors in the dental office. It also wipes out perilous waste by allowing use of reusable sterilization warps [16,17]
2. Digital radiography in place of film based x-rays. It removes toxic x-ray fixators and lead foils. It also allows for instant image availability; improvised image quality; increased diagnostic efficacy with minimal radiation exposure [18,19]
3. Always keep the dumpsters covered.
4. Use high vaccum and water spray for reducing the level of mercury vapors that are produced when amalgam restorations are removed
5. Avoid the using mercury in bulk and the staff should be trained in the proper management and disposal of the mercury containing materials

Barriers in implementation

Despite the many benefits offered by the eco-friendly dentistry, it is still slow to catch up on the trend. It is still a work in progress and it meets certain barriers in the implementation. Some of the inadequacies in this aspect are as follows:

1. The first and foremost is the "UNAWARENESS" of this concept amongst the concerned specialists. Green dentistry a budding notion and is only doing rounds on the internet, and a very few have utilized this concept.

2. The thought of building as a "Green Office" is one of the prerequisites for green dentistry. But it is difficult to convince those with a conventional dental clinic to re-build again per the guidelines of green dentistry as it would be a costly & time consuming procedure.
3. There is over-exploitation of natural resources

What is a "Green Hospital" ?
One of the four initiatives of the **Hospital 2020** movement . Its aim is to accelerate the development, use, and diffusion of environmentally preferable products, practices and construction of green buildings in hospitals and medical practices worldwide. The alliance include all interested parties in the green hospital movement from hospitals, healthcare leaders, hospital suppliers, green building vendors, universities and governmental entities who can bring valuable resources in how to build or even convert existing hospitals to become more sustainable, at the same notion provides first hand insight on the many benefits of becoming green hospitals of the future.

Leadership
Prioritize Environmental Health

Transportation
Improve Transportation Strategies for Patients and Staff

Chemicals
Substitute Harmful Chemicals with Safer Alternatives

Food
Purchase and Serve Sustainably Grown, Healthy Food

Waste
Reduce, Treat and Safely Dispose of Healthcare Waste

Pharmaceuticals
Safely Manage and Dispose of Pharmaceuticals

Energy
Implement Energy Efficiency and Clean, Renewable Energy Generation

Buildings
Support Green and Healthy Hospital Design and Construction

Water
Reduce Hospital Water Consumption and Supply Potable Water

Purchasing
Buy Safer and More Sustainable Products and Materials

Hospitals operate 24 hours a day, 365 days a year. And in the process of treating patients, they use a lot of water and energy and generate a lot of waste from medical products, protective drapes and packaging.
Here are seven ways that hospitals can better use their resources:

1. Establishing a green team: One of the first things a hospital should do before implementing a sustainability program is to create a team tasked with leading the overall initiative. For example, the team might focus on increasing the amount and type of recycling practiced at the hospital; sorting waste streams to minimize the hospital's contribution to landfills; and increasing awareness of how employees can positively impact the environment. The team should be both empowered and supported by leadership to execute initiatives but also be held to specific goals.

2. Document destruction services: While most of the hospitals recycle some papers, leaving patient documents in recycling bins could put a lot of sensitive patient information at risk. It is important for hospitals to hire a vendor who will securely collect, shred & destroy the documents and recycle the materials according to HIPAA regulations. VHA suppliers specializing in document destruction services have helped hospitals protect sensitive patient information, saving millions of trees and more than 1.25 million cubic yards of landfill space per year.

3. Medical device reprocessing: Hospitals discard everything from surgical gowns, gloves & towels to

laparoscopic ports after a single use. In operating rooms, there are items that are never used & thrown away in order to maintain a sterile environment and prevent infections. Proper reprocessing and sterilization of medical devices allows hospitals to reduce the amount of waste entering landfills. According to The Journal of Bone and Joint Surgery, reprocessed devices can cost half as much as new devices, which improves the hospital's bottom line without compromising clinical quality.

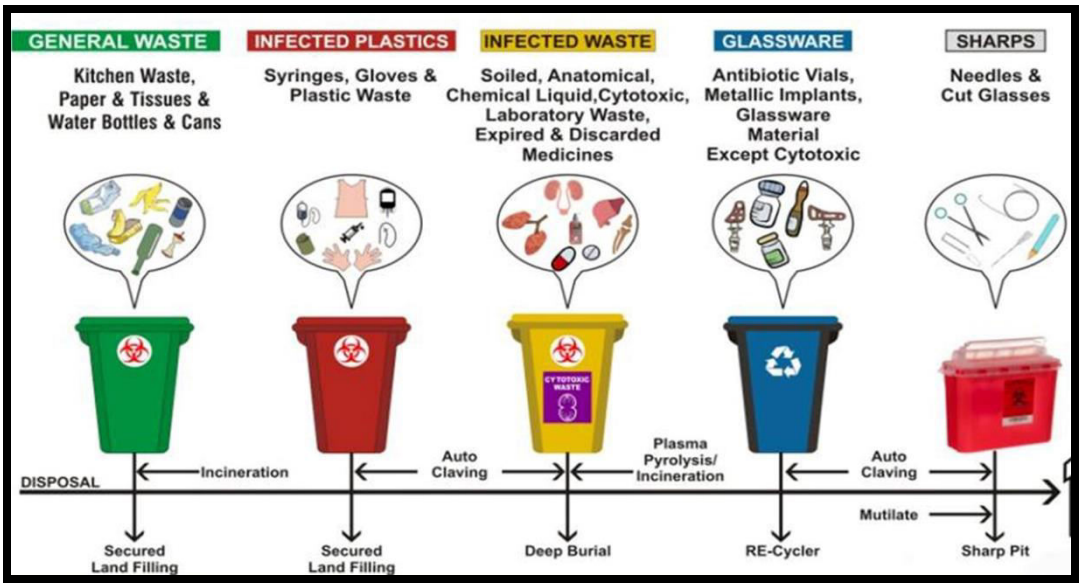
4. Document management services: Streamlining printing and copying processes can reduce costs, while improving productivity. For example, implementing a print-on-demand process reduces the amount of paper used each year. Replacing single-function devices like printers and copiers with multifunction systems, substantially reduces energy use. Remanufacturing and recycling office equipment diverts electronic waste from landfills.

5. Capital equipment re-selling and recycling: Hospitals can generate revenue by selling surplus equipment for reuse throughout the world. There are companies that will re-sell these items via live auction, and medical equipment that is not purchased can be recycled. By re-selling or recycling capital assets, hospitals can generate revenue and reduce their waste impact on the environment.

6. Computer hardware disposal: Disposal services encompass the retirement, redeployment, remarketing and environmentally responsible recycling of personal computers, workstations, servers, network equipment and associated peripherals. This not only helps break down used equipment to rare earth minerals so they can be reused, but also helps reduce the demand on finite resources and lowers the need to continue to exploit areas that have the minerals. Safe disposal of technology assets provides additional assurance of patient privacy

7. LEED certification: Having a building LEED (Leadership in Energy and Environmental Design) certified will help in 1.) Lower operating costs; 2.) Conserve energy, water and other resources; 3.) Provide a healthier environment for occupants; and 4.) Qualify for money-saving incentives, such as tax rebates and zoning allowances. In addition, LEED design encourages the use of natural light and healing gardens, since research has shown a link between nature and stress reduction and the improvement of an overall sense of well-being.

Waste management protocol to be followed by dentists & doctors in their hospitals or clinics alike

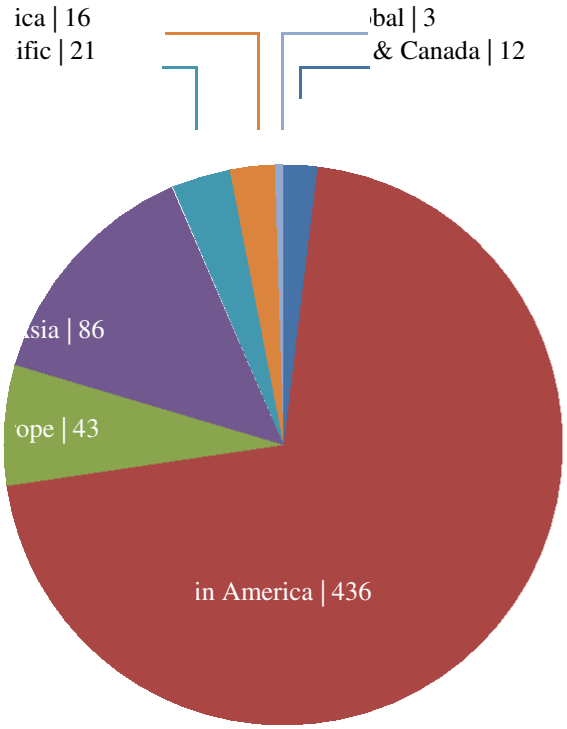


CONCLUSION

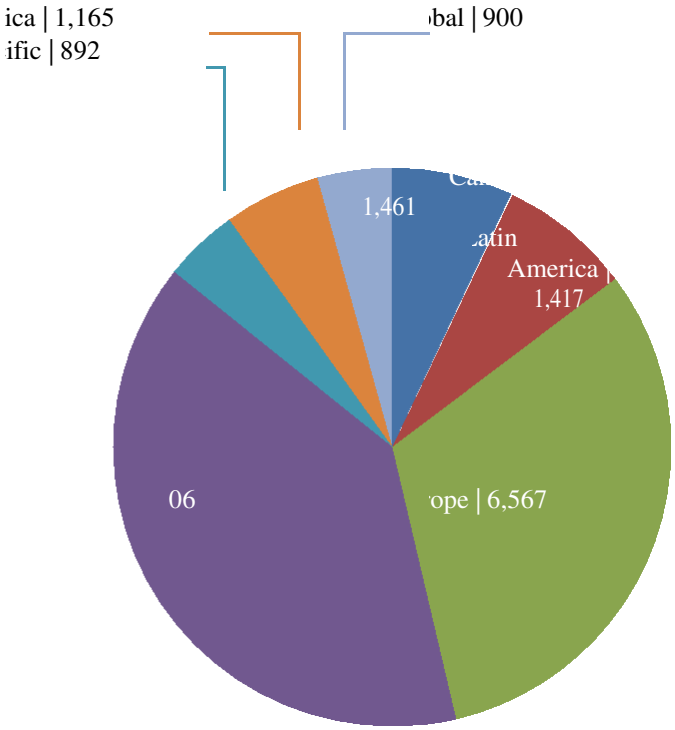
An ecofriendly dentist or doctor needs to be a re-thinker and an environmentalist also to run an ecofriendly practice. It is just a matter of choice that the healthcare professional make in order to run a green clinic or hospital. There needs to be a shift in the materials brought and how they are used in order to ensure that there is optimum utilization of all the materials keeping in mind the safety of the environment. Every healthcare professional must discharge his duty as an individual towards a greener, salubrious environment to make the world a better place to live. Many countries have also started towards working towards this

According to data acquired by www.greenhospitals.net following are the member countries who have joined to protect the environment by Going Green

Member Distribution by Region



Hospitals and Health Centers Represented by Region



REFERENCES

1. Chadha GM, Panchmal GS, Shenoy RP, Siddique S, Jodalli P. Establishing an eco friendly dental practice: A review. IJSS Case Rep Rev 2015;1:78-81.
2. Avinash B, Avinash BS, Shivalinga BM, Jyothikiran S, Padmini MN. Going green with eco friendly dentistry. J Contemp Dent Pract 2013;14:766‑9.
3. Dixit K, Dixit KK, Kapoor N. Eco‑friendly dentistry: A reality. J Dent Sci Oral Rehabil2013;1:5-6.
4. Varun Rastogi, Rachna Sharma & Vandana Sharma- Green Dentistry, A metamorphosis towards an Eco Friendly Dentistry- JCDR
5. Thota MM, Bathala LR, Theruru K, Shaik S, Jupidi B, Rayapati S. "There's plenty of room at the bottom": The biomedical waste management in dentistry. J NTR Univ Health Sci 2014;3:149‑55.
6. Rastogi V, Sharma R, Yadav L, Satpute P, Sharma V. Green dentistry, a metamorphosis towards an eco friendly dentistry: A short communication. J Clin Diagn Res 2014;8:ZM01-2.
7. Eco dentistry association. Dental office waste and pollution. Available from: http://www.ecodentistry.org/?page=OfficeWasteandhhSearchTerms=Dental+and+Office+and+Waste+and+Pollution [Last accessed on 2013 Nov 11].
8. Muhamedgic B, Muhamedgic L, Masic I. Dental office waste- Public health and Ecological risk
9. Chopra A, Gupta N, ChandRao N, Vashisth S. Eco-dentistry: The environment-friendly dentistry.
10. CDC. Guideline for Hand Hygiene in Healthcare Settings. Recommendations of the Healthcare Infection Control Practices Advisory Committee and the HICPAC/SHEA/APIC/IDSA Hand Hygiene Task Force. Society for Healthcare Epidemiology of America/Association for Professionals in Infection Control/Infectious Diseases Society of America. MMWR Recomm Rep 2002;51:1-45.
11. Eco dentistry association. The global water crisis. Available from: http://www.ecodentistry.org/?saveswater.
12. Donaldson K. Is your office environmentally responsible? RDH 2011;31:46-52. Available from: http://www.rdhmag.com/articles/print/volume-31/issue-4/features/is-your-office-environmentally-responsible.html.
13. Hu-friedy. Environdent. Available from: http://www.hu-friedy.com/programs/environdent.aspx
14. ADA. 150 ways to go green. Available from: http://www.ada.org/sections/professionalResources/pdfs/5402_150_ways.pdf
15. Chopra A, Gupta N, ChandRao N, Vashisth S. Eco-dentistry: The environment-friendly dentistry.
16. Webster dictionary. Pollution. Available from: http://www.webster dictionary.org/ [Last accessed on 2013 Nov 11].

17. Eco dentistry association green dentistry is high tech dentistry. Available from: http://www.ecodentistry.org/?page=HighTechDentistry and hhSearchTerms=hi+and+tech+and+dentistry [Last accessed on 2013 Nov 11].
18. CDC. Guideline for disinfection and sterilization in healthcare facilities, 2008. Available from: http://www.cdc.gov/hicpac/pdf/guidelines/Disinfection_Nov_2008.pdf [Last accessed on 2013 Nov 11].
19. Adams E. Eco friendly dentistry: Not a matter of choice. J Can Dent Assoc 2007;73:581-4.
20. BerkhoutE, Sanderink G, Stelt. Digital intra‐oral radiography in dentistry. Diagnostic efficacy and dose considerations. Oral Radiol 2003;19:1-13.
21. Hospital 2020.org
22. Greenhospitals.net