

Reducing infection transmission: *The solution must match the problem*



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Infection results from the inoculation of a suitable number of a suitably pathogenic microbe into a suitably susceptible site.

Reducing microbial numbers within this process is crucial to infection control. It is the factor most amenable to control

It has to be **within this process – i.e. specifically targeted.**
There is no advantage to trying to turn hospitals into sterile zones

- a) This will not work
- b) It will not stop the specific transfer to susceptible sites

HIGH - Anything that enters a normally sterile body area

Sterilised

MEDIUM - Anything in contact with intact mucous membrane

Sterilised, heat disinfected, chemical disinfected only if thermolabile

LOW - Anything in contact with intact skin

Sterilised, heat or chemical disinfected, cleaned (socially)

MINIMAL – Items not normally in contact with a patient

Cleaned; disinfected in exceptional circumstances

Hospitals select out microbes that are:

Antibiotic resistant

Good at adapting to a new host (infecting or colonising)

They are not highly pathogenic (able to cause disease). They do not need to be – the population infected are unusually susceptible

Hospitals take people with similar susceptibilities (e.g. a ward full of people with surgical wounds, tracheostomies or urinary catheters) and put them close together in the same space.

Hospitals are the ideal environment for some microbes. They will adapt to the selective pressures of this environment.

Microbes that can transmit within hospitals are usually different from those that exist outside (there are exceptions e.g. norovirus)

Aesthetic vs. hygienic



Just because something looks dirty does not mean it is an infection risk – **but patients have a right to be cared for in a clean environment whatever the infection risk or lack of it**

Just because something looks clean does not indicate the lack of an infection risk

The aesthetic and the hygienic do not always equate

Levels of evidence in infection control



Infection control is not the natural home of evidence-based practice

Adequately controlled studies are rare

Changes in response to outbreaks are multiple (planned and unplanned)

Infection levels will rise and fall naturally, these may coincide with interventions

It is easier to publish good news stories than “*we did this and nothing happened*” stories

Single examples and anecdote are often all that exists

Extrapolation and analogy are much used

How to tell if an intervention may prevent infection



Difficult

Try to establish an independent consensus

Peer reviewed publications better than non-peer reviewed

Beware of “cherry-picked” examples

Beware of vague concepts e.g. “reservoir of infection”

Do not rely on one expert or report (usually indication of potential rather than conclusive proof)

Rapid Review Panel – but only reviews novel products

Reminder: The aim is not to produce a sterile hospital but to interrupt routes of transmission.

Sterilisation

Vital, but not our problem.

Disinfection

Could be by heat or chemicals (QA problems)

Cleaning

The more the manual component, the lower the QA.

Air hygiene

The role of air, outside specific situations (TB, theatres, highly immunocompromised) is unproven

Protection of susceptible sites

e.g. dressings (impervious/antimicrobial), air in an operating theatre

Procedural

e.g. handwashing. Also procedural component of the above interventions – must do them at the right time

Disinfection - heat



With washer-disinfectors (e.g. bedpan), a highly controlled process

With steam cleaners:

- Can never be hotter than 100°C in application

- Will cool rapidly after it emerges from the pressure reservoir. Machines differ in how close this is to the point of application

- Takes time for items being cleaned to equilibrate to disinfection temperatures – operator and machine dependent

They are a good means of cleaning but there are sometimes excessive claims (“superheated steam” and “140°C”) and unrealistic tests (holding the nozzle in one place for longer than would usually occur)

Disinfection - chemical



Effective disinfection is far more than the ability to kill “germ X” in lab tests (e.g. “kills MRSA” – they all do. Resistance to antibiotics does not equate with resistance to disinfectants). The ability to kill a particular target microbe is a starting point for consideration but other factors need to be taken into account. Examples:

- Inactivation by organic matter

- Inability to penetrate lumps, clots, dried organic matter

- Inadequate coverage (improper immersion, air bubble, poor coverage etc.)

- Contact time, including time to drying

Disinfection can be a specific, targeted intervention. The general, indiscriminate use of a disinfectant is unlikely to contribute to infection prevention.

Disinfection – antibacterial surfaces



Disinfectant molecules need to migrate into their target cell. This means they work either in a liquid phase (most) or as a gas. They will not work when dry on a surface.

This is important when antibacterial claims are made for surfaces, either by impregnation of antibacterials in the surface material or by deposition of a layer of disinfectant.

Microbes are carried around on particles (dust, lint, skin scales) or are imprinted dry (e.g. by finger contact). There will not be sufficient free water to carry the disinfectant molecules into their targets.

This also applies to products that claim to leave an adherent antibacterial layer on a surface

If in liquid spills, any organic matter is likely to inactivate the small amount of disinfectant present

The lab tests are usually done in 100% humidity with no organic matter over 24 hours. This has limited applicability to most situations.

If a product claims to leave an adherent antibacterial layer behind, it must also be proved to resist removal by routine hospital cleaning

If people think that a surface is “self sterilising”, it may get less cleaning or specific disinfection.

Hydrogen peroxide fumigation



This is the generation of a microbicidal gas to surface disinfect an enclosed space

Toxic

Poor penetration

Takes time to prepare, carry out & remove the gas

Must be by gas and not spraying droplets (“fogging”) - areas will be shadowed from droplet deposition

If used, it must be part of a rational strategy

Must be after an end to dispersion in an areas can be identified – an isolation room following discharge of specific patients or an emptied ward to be repopulated by a different patient group

If an intervention is to be effective, it needs to be done between patient contacts. Examples:-

So someone invents a BP cuff or commode that is easily cleaned. It still need to have the people, equipment, time and space to do it between every use

There is a washer on site for beds or commodes. Doing each one once a month will not interrupt transmission between the majority of users

No point in fumigating a room or area on a routine basis. Need to do it when an end to specific recontamination can be defined, before another susceptible patient occupies that space.

Final message



Always think:

If product X is the answer, what is the question?

What route of transmission is it interrupting?

Does the product work and, if it does, how does this make any difference to HCAI transmission?

Is it feasible to use it as it should be used?