Practical Aspects of Reducing Bioburden with Copper

Clinical Case Study: Selly Oak Hospital, Birmingham

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Antimicrobial Copper

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Introduction

There is now substantial scientific evidence to support the replacement of frequently touched equipment and fittings in the clinical environment with those incorporating copper to reduce contamination and therefore reduce the risk of infection. The Copper Clinical Trial, conducted on a busy medical ward at Selly Oak Hospital, demonstrated a 90-100% reduction in contamination on copper-containing vs standard surfaces. The experience of fitting out the test ward with a full range of copper-containing products has made a major contribution to the understanding of the practical application of the science.

The Selly Oak trial has allowed the simplicity of the installation of copper-containing touch surfaces to be appreciated by all concerned, and has also initiated a series of developments within the supply chain resulting in the availability of key, uncoated copper and copper alloy products for ward fit-outs at a cost comparable to standard components.

This publication draws on the experience of the Selly Oak copper fit-out to outline the steps needed for the identification of touch surface hotspots, to explain the simplicity of the installation and maintenance of these components and to consider retrofitting costs. This case study is a significant step towards the development of best practice in incorporating copper in the clinical environment to optimise hygiene and help reduce the spread of infection. Cost data has been extrapolated from the test ward configuration (Nightingale) to an all single-room configuration and is also presented here.

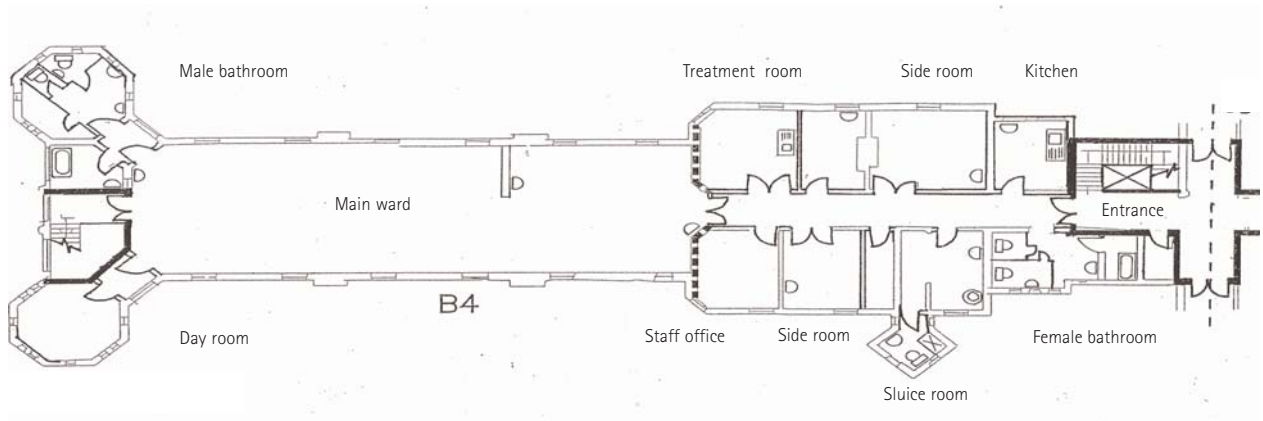
Multidisciplinary Team Approach

The clinical trial at Selly Oak had input from clinicians, nurses, infection control practitioners and the Estates team to ensure that:

- the surfaces at highest risk of being contaminated, and which therefore act as reservoirs of infection, were selected for substitution with copper fittings and equipment
- the integration of copper into those surfaces was practical and cost-effective
- installation was carried out with minimal disruption to the working ward
- the copper surfaces were assessed for impact on environmental contamination under everyday use
- the needs of staff, visitors and patients were not compromised.

The Test Ward

The site of the trial is a 20-bedded acute medical ward, B4. The layout is a traditional Nightingale style ward with 2 side rooms, one single room and one double room. The ward is mixed sex with separate toilet and washing facilities. The female area is comprised of two toilets, two separate sinks and a bathroom. The male toilets are the same but also have a shower area. Other rooms include a clinical treatment room, kitchen, staff room and staff office. Also at the end of the ward there is a patient day room.



Layout of test ward, B4

Identification of Touch Surfaces 'Hotspots'

The trial team drew on their joint experience to select the surfaces at the greatest risk of being contaminated through everyday use. These were added to the 'wish list' of products for substitution with copper-containing material (see below). While any copper surface can help reduce contamination, there is a critical set of surfaces for each type of clinical environment which would need to incorporate copper.

cistern flush levers	dressings trolleys	soap dispensers*
apron dispensers*	towel dispensers*	commodes
sink traps and wastes#	call buttons*	push plates
thumb turns	cubicle locks	grab rails
hot and cold taps	toilet seats	light switches
power sockets	bed table tops	drip pole stand*

*These 'wish list' components were not available in time to be installed but are now under development.

#While these are not touch surface items, concerns were raised about *Pseudomonas aeruginosa* colonising standard plastic sink traps and wastes and so these were substituted with copper traps and brass wastes.

Design and Supply of Components

A group of manufacturers were co-ordinated by Copper Development Association to provide the necessary like-for-like copper products, adapting their ranges to match existing fittings or prototyping new designs. Where possible, products made from solid copper or copper alloys were used as this avoided the need to monitor surface wear and consider replacement. Due to time constraints and a deadline for installation of products for inclusion in the trial, some coated products were used, for example the copper-composite spray-coated toilet seats and the copper electroplated flush handle. For the majority of the other products, manufacturers used solid copper, brass and bronze alloys with a minimum copper content of 60% (for maximum antimicrobial efficacy) and supplied products without wax or other surface coatings.

Verification and Fitting of Components

Copper products were delivered to the Estates team, who verified their suitability and organised installation. Fitting of all the components proved trouble-free, there being no specialist training required. Maintenance was also negligible (at the time of writing, most fittings have been on the ward for nearly two years). Early reported complaints of sink wastes becoming clogged was soon tracked down to an inappropriate disposal of solids down the sinks.

Installation Times

Installation times for copper fittings were no different to standard fittings. Example fitting times are given below (provided by Selly Oak Estates Team).

Component	Fitting Time
Handles, locks, push plates and kick plates	30 mins each
Light switches and power sockets	20 mins each
Taps, traps and wastes	2.5 hours each
Toilet seats and cistern flush	20 mins each
Total 20 bed Nightingale ward with side rooms and all shared services	164 hours
Total 20 single rooms and all shared services	593 hours

Initial Evaluation of Staff and Patient Acceptance

The items were installed at least six-months prior to commencement of the study to allow both healthcare workers and domestic staff to become accustomed to the copper-containing fixtures. During the 'bedding in' period, staff, patients' and visitors' questions regarding the visually distinct components (red, gold, bronze colours) were addressed via an information sheet.

Cleaning

The domestic staff followed their standard ward cleaning timetable. The same cleaning agents (Chlor-clean [sodium dichloroisocyanurate with 1000ppm available chlorine and detergent], Guest Medical, UK) and protocol were used for both copper and non-copper-containing items. Copper and copper alloys surfaces are active and will darken (oxidise) *in situ*. Fortunately, the oxidised surface is more active at killing germs. This oxide layer will wear away with frequent touch (for example on a brass hand rail) to reveal the original colour. Oxidation more severe than this darkening will only occur in the absence of cleaning.

Cost

Given that the trial ward was a typical 20 bed unit with some side rooms, it was considered reasonable that this would form the basis of a cost exercise. This is also typical of the size of many single bedded, en-suite hospital unit situations. It is expected that copper alloy fittings will be installed as part of regular planned maintenance or complete refurbishment projects. This means that the fittings cost will be identical with that of fitting germ harbouring stainless steel, aluminium or plastic. However, if the refit project needs to include labour times, these have been provided by the Selly Oak Estates Team (see earlier section).

The cost differentials were primarily associated with just three items: the toilet seat, dressings trolley and over-bed table. The toilet seat includes a composite material that is at present expensive to apply; the cost will be significantly reduced when the technology is applied industrially. The other two items were custom made for the trial and therefore reflect high labour costs; in both cases the industrialisation process will bring down these costs significantly. But for the short term these products will inevitably command a premium price.

Conclusions

Copper and copper alloy fittings are proven to reduce environmental contamination on their surfaces in the clinical environment by between 90 and 100%, so making a contribution to improved hygiene. Some touch surface products such as door furniture and sanitary fittings are already available in uncoated copper or copper alloys and new products and equipment are now under development. 'Ward solution' - sets of components - will vary according to the type of ward and factors such as patient mobility. Components are familiar, easy to install and have long service lives. Products made from solid materials will remain effective in killing germs throughout their lives, even if scratched. This case study shows a zero capital cost differential for copper vs standard components when considering items already in production, and only a £6-7k additional cost when including the three prototyped products (over-bed tables, dressings trolley and toilet seat). This is equivalent to the (admitted) cost of one infection.

Further Information

Visit www.antimicrobialcopper.com for information on the antimicrobial properties and applications of copper, read FAQs and view the online product catalogue.

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Mercury Composites	Nottingham Rehab Supplies	OMC Technologies	Parker Pens
Rycroft Ltd	TG Stamping & Machining Ltd	Triflow Concepts Ltd	Union Architectural Hardware
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