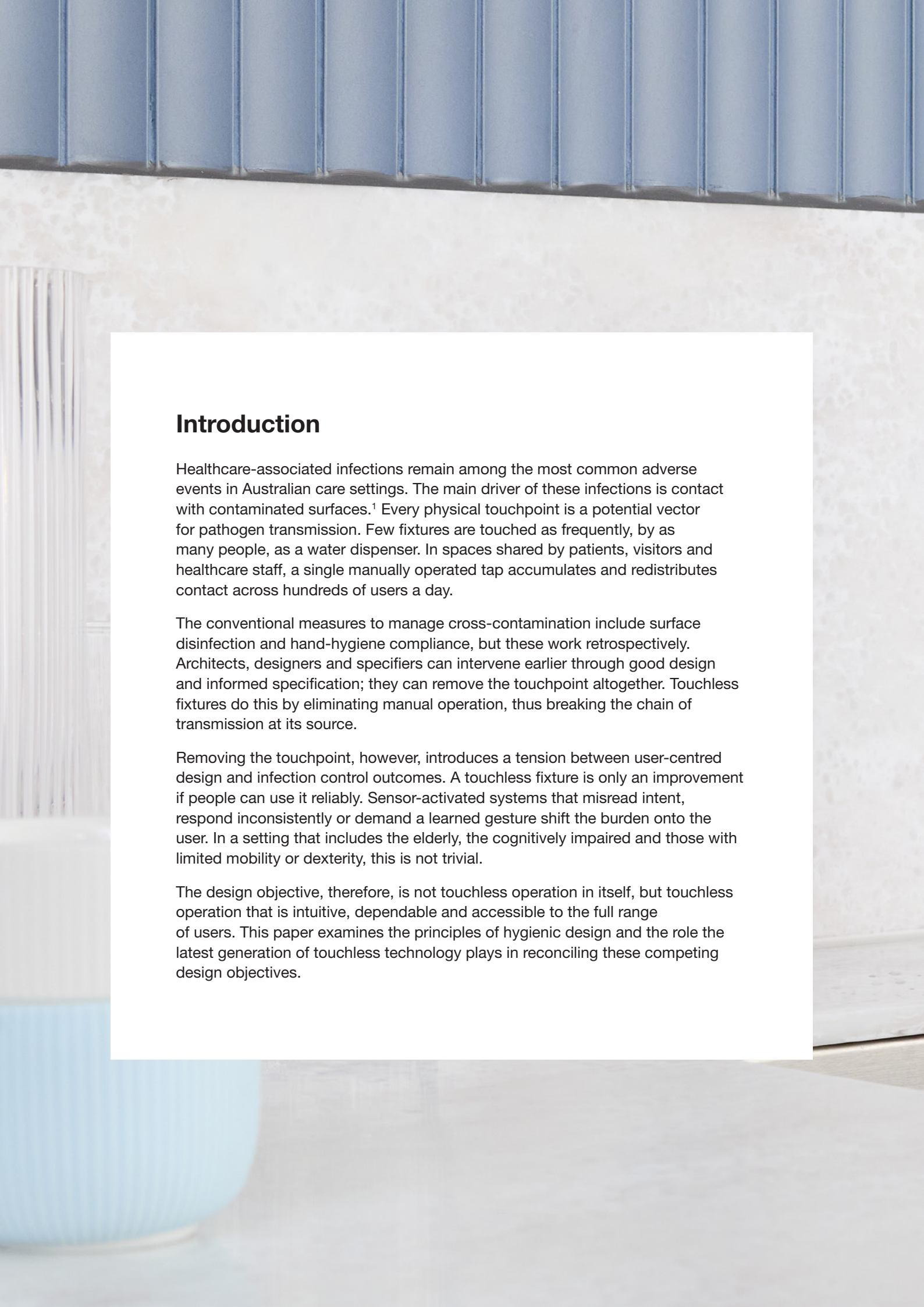
Making Touchless Design Work

Balancing Infection Control and Usability in Clinical and Aged Care Environments



Billi



Introduction

Healthcare-associated infections remain among the most common adverse events in Australian care settings. The main driver of these infections is contact with contaminated surfaces.[1] Every physical touchpoint is a potential vector for pathogen transmission. Few fixtures are touched as frequently, by as many people, as a water dispenser. In spaces shared by patients, visitors and healthcare staff, a single manually operated tap accumulates and redistributes contact across hundreds of users a day.

The conventional measures to manage cross-contamination include surface disinfection and hand-hygiene compliance, but these work retrospectively. Architects, designers and specifiers can intervene earlier through good design and informed specification; they can remove the touchpoint altogether. Touchless fixtures do this by eliminating manual operation, thus breaking the chain of transmission at its source.

Removing the touchpoint, however, introduces a tension between user-centred design and infection control outcomes. A touchless fixture is only an improvement if people can use it reliably. Sensor-activated systems that misread intent, respond inconsistently or demand a learned gesture shift the burden onto the user. In a setting that includes the elderly, the cognitively impaired and those with limited mobility or dexterity, this is not trivial.

The design objective, therefore, is not touchless operation in itself, but touchless operation that is intuitive, dependable and accessible to the full range of users. This paper examines the principles of hygienic design and the role the latest generation of touchless technology plays in reconciling these competing design objectives.


SUGAR
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Scale and mechanics of cross-contamination

The burden of healthcare-associated infection in Australia is substantial. A national modelling study estimates that 170,574 HAIs occur annually among adults admitted to Australian public hospitals, resulting in 7,583 deaths.[2] Hospital-acquired pneumonia is the most frequent, followed by surgical site infections and urinary tract infections; bloodstream infections account for a small share of cases but the highest number of deaths.[3] Measured per capita, the Australian burden is broadly comparable to Europe's.[4]

In healthcare settings, transmission by touch, such as hand-to-surface and surface-to-hand, remains one of the most persistent routes by which pathogens move between people. High-traffic fixtures concentrate the risk. In a 400-bed hospital, a single shared water dispenser may be handled several hundred times a day by patients, visitors, clinicians and cleaning staff, often within minutes of one another. Each contact is an opportunity for pathogens to spread, with the fixture itself becoming the surface linking users who may never have met.

Taps and their surrounds are a well-documented reservoir. Pathogens, including Pseudomonas aeruginosa, Legionella, Acinetobacter and Escherichia coli, establish themselves in biofilms within plumbing, where they persist and resist routine cleaning. Contaminated splash-back from the drain settles on tap surfaces and patients or staff then transfer these organisms by direct touch.[5] Parasitic cysts such as Cryptosporidium and Giardia present a related waterborne risk.

Regulatory framework

Fixture selection in clinical and aged-care settings is governed by several codes and standards.

Plumbing fixtures must comply with the National Construction Code (NCC) Volume Three, the Plumbing Code of Australia (PCA). Under the PCA, products connected to the drinking water supply must carry WaterMark certification. The standard behind that certification depends on the product. Tapware is certified against AS/NZS 3718, and point-of-use dispensers and filtration units against AS/NZS 3497. Materials in contact with drinking water are tested to AS/NZS 4020, and copper-alloy products must meet the PCA's lead-free requirements.

Accessibility is governed by AS 1428.1, which requires controls to be operable by people with limited hand function and positioned within reach. AS 1428.2 adds further reach range and control provisions relevant to seated users. While not mandatory under the NCC, healthcare and aged-care briefs often adopt these standards.

Hygienic design adds a further requirement. It favours hands-free operation and minimal contact to prevent infection and contamination, while AS 1428.1 favours controls that every user can locate, reach and operate. The hygienic design principles below show where these requirements meet and where they need to be reconciled.

Principles of hygienic design

Hygienic design reduces the risk of HAIs by ensuring that surfaces, fittings and equipment can be cleaned easily, thoroughly and repeatedly. The below principles are well established across the sector and translate directly into specification decisions.

- **Cleanable surfaces.** Materials should present a smooth, non-porous face that withstands rigorous cleaning and repeated chemical disinfection without pitting, dulling or corroding. Porosity, micro-cracking, and surface roughness all create spaces in which organisms accumulate beyond the reach of routine cleaning. Material selection must be matched to the cleaning agents actually used on site.
- **Seamless integration.** Gaps, joints, and crevices can harbour bacteria and pathogens. Integrating components and minimising junctions removes the interstitial spaces in which biofilms establish and persist.
- **Water and drainage management.** Standing water and wet surfaces are among the most persistent reservoirs in a care environment, sustaining organisms such as Pseudomonas and Legionella. Fixtures should shed water, drain completely and avoid pooling, splash-back, and aerosol generation.
- **Minimising touchpoints.** Every surface a user must contact is a point in which bacteria and pathogens can be spread. The most reliable way to control a touchpoint is to remove the need to touch it at all.

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Hygiene vs. usability

The most hygienic surface is of little value if it is difficult to operate, avoided by users or so specialised that it cannot adapt to changing clinical needs. Hygiene that comes at the cost of function tends not to survive contact with daily use: staff and residents tend to find workarounds. Hygiene performance that holds up only in a testing lab is not a solution a building can rely on.

A fixture must be both contamination-resistant and intuitively operable by everyone who approaches it. This includes those with arthritic hands, limited dexterity or cognitive impairment. Usability is not a concession to be traded away; it is what determines whether the hygienic design is actually used and, therefore, whether it works at all. A water dispenser that frustrates its users delivers none of the protection it was specified to provide and further represents a wasted investment.

Another important consideration is futureproofing. Care environments change over time as clinical uses are reconfigured and layouts are altered. A specification that is optimised for a single present-day scenario risks obsolescence the moment circumstances shift.

Adaptability operates on several fronts. The most immediate is the user population itself, which is rarely fixed. A healthcare space may shift from ambulatory patients to those with reduced mobility; an aged-care facility's residents grow frailer over the life of the building; a staff room serves clinicians for one year and students on placement the next. A fixture that accommodates the full range of abilities from the outset can accommodate these changes.

The sections that follow examine how touchless technology can support hygiene, usability and adaptability.

How touchless technology breaks the chain of contamination

Infection control works from a standard model: the chain of infection. Transmission requires six links in sequence: a pathogen, a reservoir, a portal of exit, a mode of transmission, a portal of entry, and a susceptible host.[6] Break any single link and transmission stops.

Of these links, the mode of transmission is the one most exposed to design intervention. In patient-care environments, indirect contact transmission, where a pathogen passes from person to person via a contaminated intermediate surface, is preventable. A manually operated tap or dispenser is a textbook example: it concentrates hand contact at a fixed point. The fixture becomes the intermediate surface that completes the chain.

Touchless activation removes the intermediate surface from the chain of infection. With no shared contact point, there is no interface to transmit microorganisms or bacterium between users. In addition, the reservoir is far less likely to form in the first place. Cleaning reduces contamination between contact events; elimination prevents the contact event from occurring at all.

Touchless activation removes the interface, not the fixture. The physical unit remains, and with it a set of residual surfaces that still demand hygienic attention, including dispensing spouts, drip trays and the joinery and adjacent surfaces where water and hands still meet. This is why touchless technology and hygienic design are complementary. Removing the touchpoint breaks the most exposed link in the chain; hygienic design of the surfaces that remain ensures no new link takes its place. Together they form a more complete solution.

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Where some touchless solutions have fallen short

Even before the COVID-19 pandemic, specifiers were reaching for touchless technology, yet adoption has been slower than expected. The reasons lie in the execution: earlier generations of touchless fixtures introduced problems of their own, and several persist in current market offerings.

- **Reliability.** Sensor taps that misread intent, activate inadvertently or fail to respond erode user trust quickly. Some models featured sensors that did not work correctly due to reflective surfaces or ambient light.
- **Installation complexity.** Some systems are considered overly complex to specify and install.
- **Perceived sustainability costs.** There is a belief that automated taps waste water or energy even though automatic shut-off delivers superior efficiency to a manual tap left running.
- **Single-mode rigidity.** Many systems offer motion sensing alone, which frustrates any user needing precise control. For example, a user filling a drink bottle or a jug needs the water to run continuously, not to stop the moment a hand shifts out of the sensor's field.
- **Internal design complexity.** Older sensor faucets often rely on intricate components and complex solenoid valves that create the very crevices in which biofilm and bacteria accumulate. Newly certified Billi filter range for up to 99.6% PFOS/PFOA (PFAS) removal, has just been released to market. [994062 & 994117]
- **Accessibility constraints.** Fixtures that assume a standard user exclude those with limited dexterity, mobility or cognitive impairments. A simple example is a sensor positioned for a standing adult may be out of reach from a wheelchair, or a system that has no visible cue as to how it works can baffle a user with cognitive impairment.

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How Billi XT Motion balances contamination control with user-centred design

The shortcomings of earlier touchless fixtures were not arguments against touchless design. They were arguments against touchless design that did not put the user first. The answer is not to return to manual operation but to design hygiene and usability into one system. The Billi XT Motion, winner of a 2026 Australian Good Design Award in the Product Design – Domestic Appliances category, shows what that integration looks like in practice.

Dual control

The XT Motion is a drinking water dispenser that delivers boiling, chilled, and sparkling filtered water through an integrated dual-control interface, activated either by contactless motion sensing or by touch. As both modes are built into one fixture, the user can choose the mode that suits the task.

- Contactless as the default. Motion activation handles the majority of interactions, including the quick fill between tasks, where the transfer vector matters most.
- Touch as an option. Users needing precise volume or tactile confirmation, such as filling a vessel to a set level, retain a tactile control.

Inclusive by design

Due to its dual-mode approach, a single unit meets a much wider range of users.

- A user who cannot reliably trigger a motion sensor retains a touch option.
- A user for whom touch is difficult retains full contactless operation.
- A safety lock on boiling delivery adds a further layer of protection in environments shared with vulnerable users.

Ideal for healthcare & aged care

Engineered for clinical and aged care settings where hygiene is essential. The XT Motion touchless technology provides a hygienic hydration solution for staff, patients and residents.

The XT Motion dispenser pairs with a range of Billi systems, so the fixture can be matched to the demands of the space. Available in a variety of water combinations and capacities from 10 – 180 users.

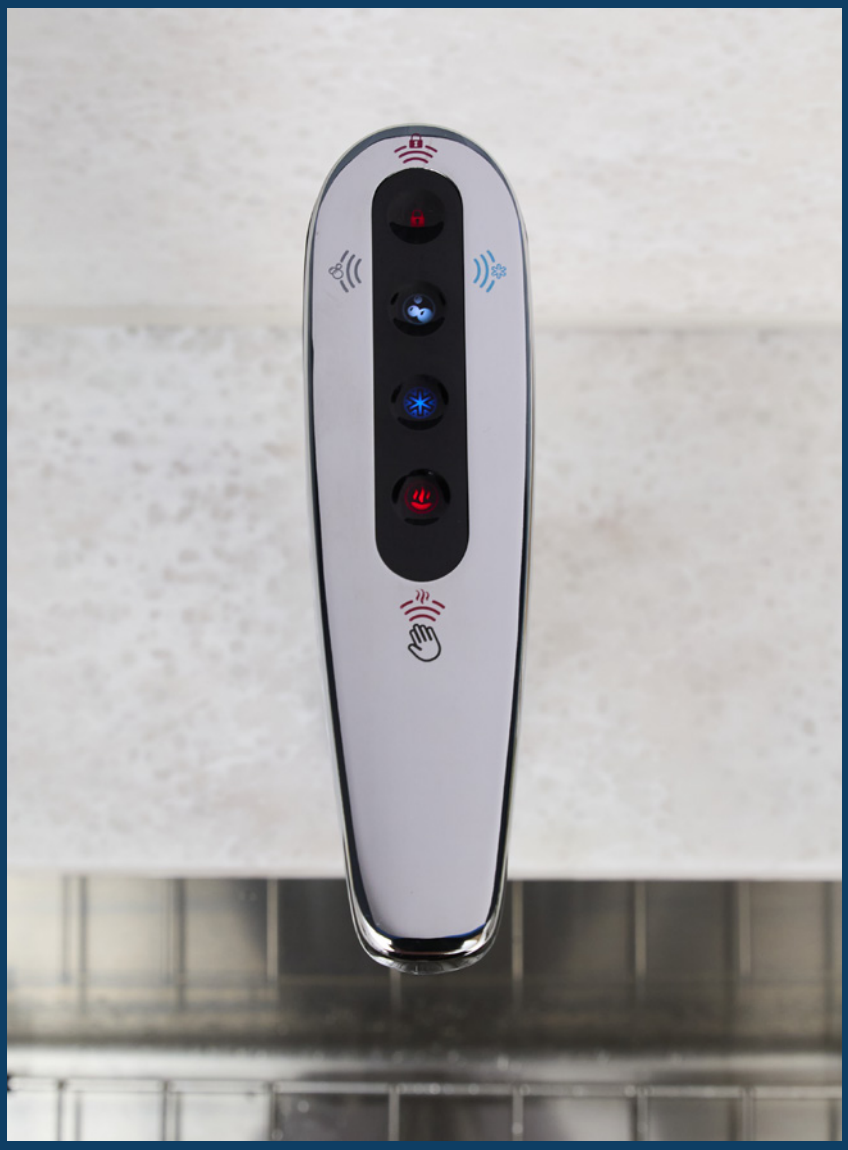
Filtration

Billi filtration, certified under NSF/ANSI 42 & 53, reduces sediment and chlorine and improves taste and odour, with 0.2-micron filter models certified to reduce parasitic cysts, including Cryptosporidium and Giardia.

Finish and specification

Billi underbench systems are engineered to fit neatly into cabinetry, and present only the multi-dispense taps, in matte & metallic finishes. Available in chrome, brushed and matte black.





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All information provided correct as of October 2026

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