Fremtidens sykehus – teknikk og areal

...... og kirurgi på bygg

(..... og kirurgi og bygg)

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Hygiene er noe dritt

--- for sykehusplanleggere

--- for teknisk driftspersonell

Hygiene og bygg er noe dritt fordi det er:

- Ukjent
- Uforståelig
- Ulogisk
- Upresist
- Uhåndgripelig

- Komplisert
- Ikke alltid dokumentert
- Subjektivt
- Relativt få standarder, forskrifter, nasjonale krav og retningslinjer

Når sykehuset bli pasient

- Hud og slimhinner
- Luftveier
- Blodårer
- Fordøyelsessystem
- Skjelett, muskulatur og ledd
- Sentralnervesystem

Kirurgi

- Diagnostikk
  - Biopsi
  - Radiologi
  - Endoskopi
  - Kjemi
  - Mikrobiolgi
- Behandling
  - Insisjon etc
  - Suturering
  - Endoskopi
  - Borring og saging
  - Dilatasjon og lukking
- Instrumentbehandling
- Sårbehandling og kontroll

Generell ønskeliste

- Modulbasert løsninger med tanke på utskiftninger og reparasjoner
- Avgrensinger tilsvarende brannceller
- Kategorisering
- Standardisering
- Endoskopiske prosedyrer
- Materialvalg for flater, inventar og utstyr
- Kommunikasjon

Viktige områder - standardrom

- Sengegrom
- Undersøkels/behandlingsrom
  - klinisk us
  - radiologi
  - fysioterapi
- - - - -

Viktige områder - smitte

- Isolater/enerom
- Desinfeksjonsrom
- Laboratorier
- Operasjonsstuer
- Avfallsrom
- - - - -

Viktige områder (aseptikk)

- Operasjonsstuer
- Skiftestuer
- Sterilsentral
- Røntgenlaboratorier
- Sengerom
- Undersøkelsesrom
- Medisinrom
- - - - -

Viktige områder - intern transport

- Planløsning
- Korridorer
- Heiser
- - - - -

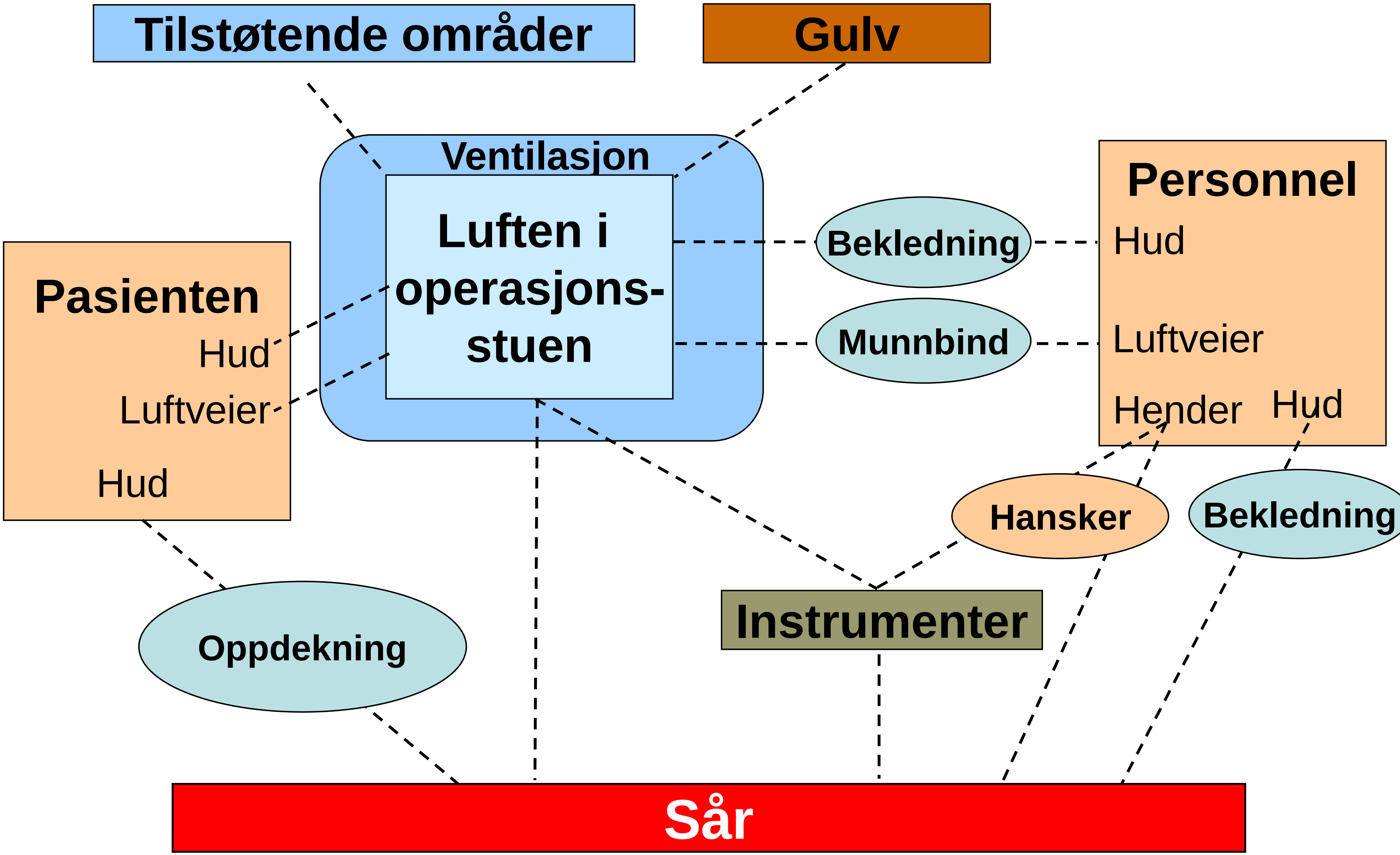
Viktige områder - ”detaljer”

- Overflater
  - rengjøringsvennlighet
  - resistens mot desinfeksjonsmidler
  - design

En av operasjonsstuene.

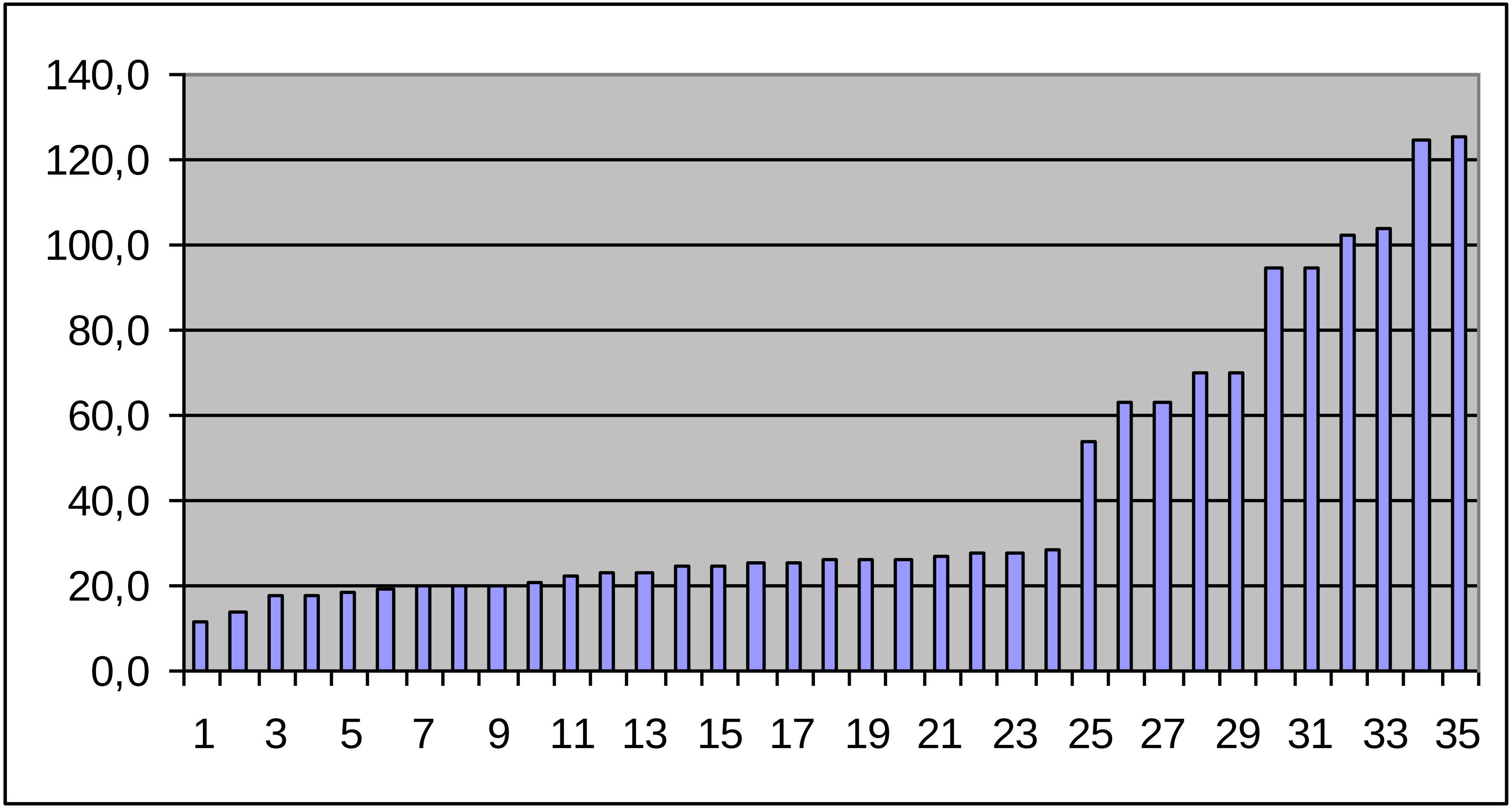
Ventilasjon

Opprinnelsen til kontaminasjon av operasjonssår

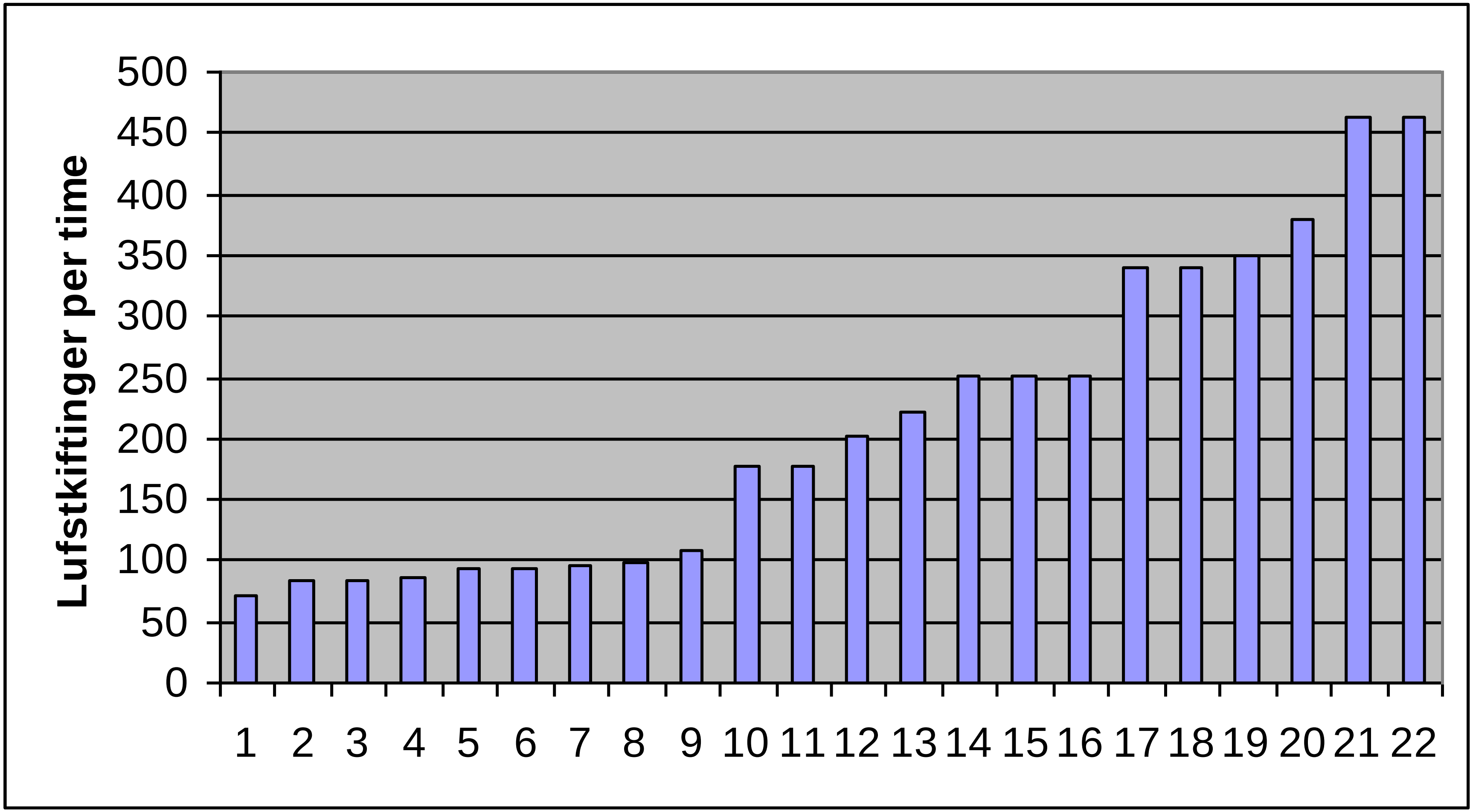


Ventilasjon i ortopediske operasjonsstuer i Helse Sør-Øst 2008

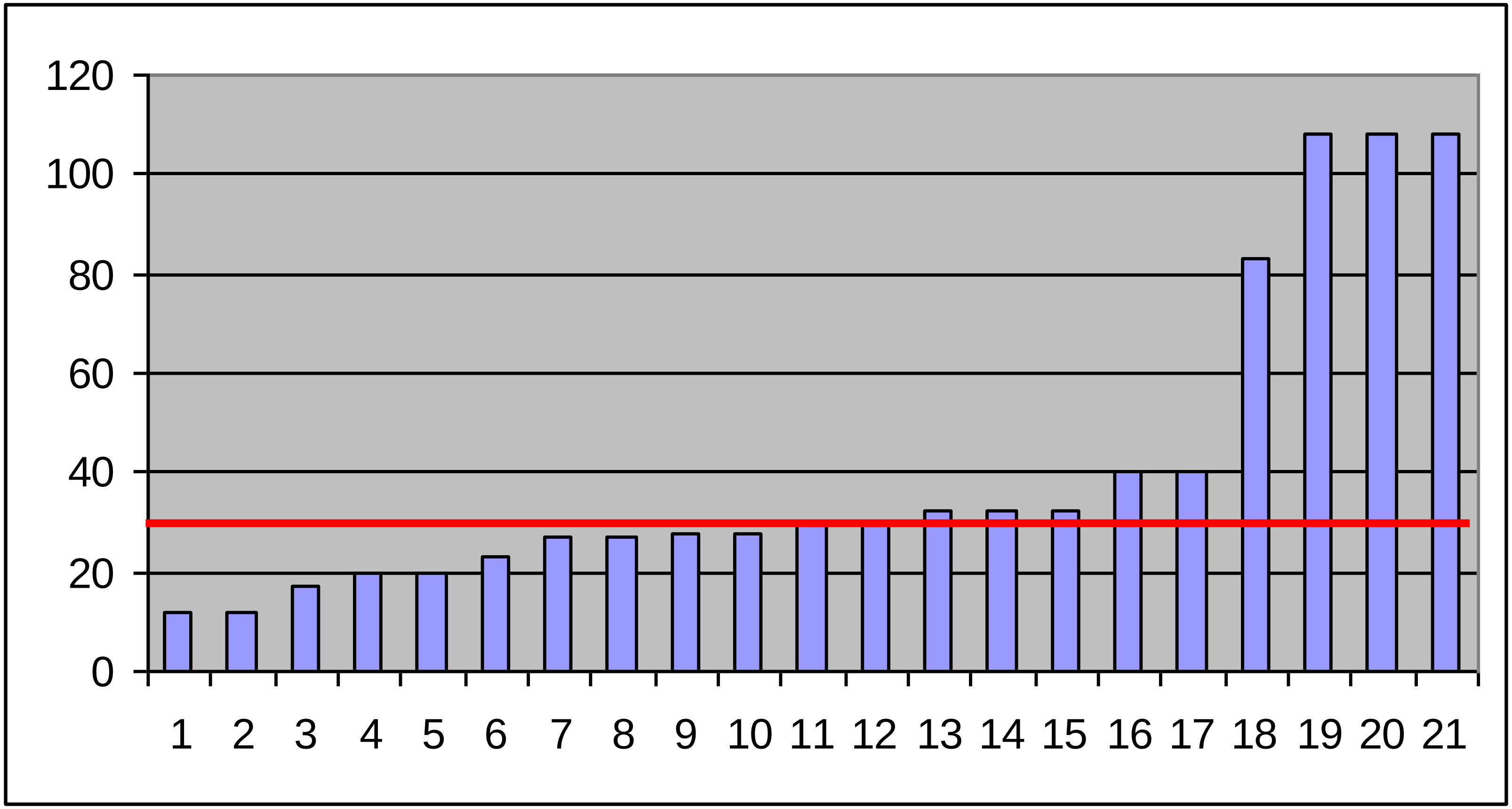
Antall luftskiftinger per time



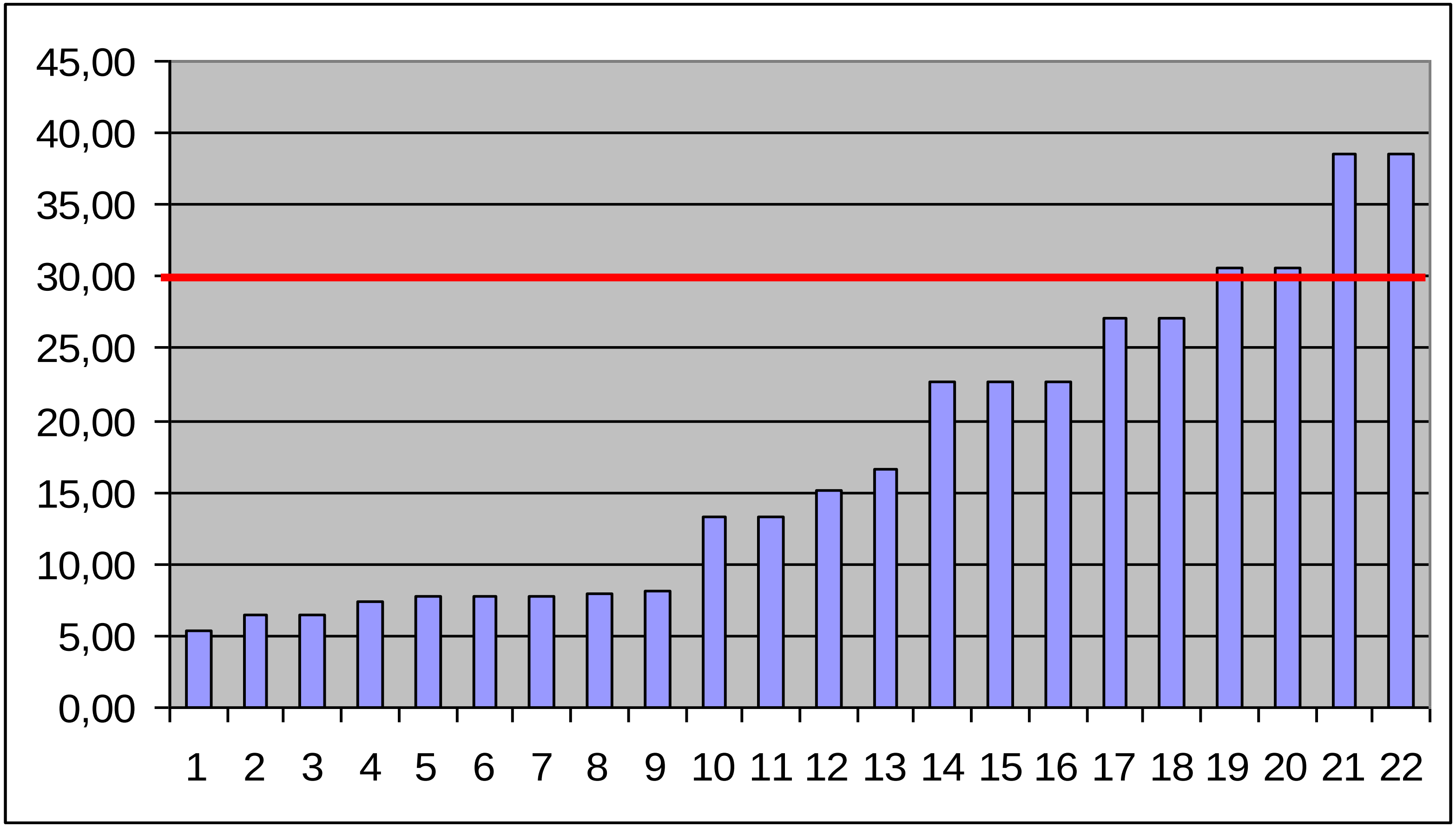
Antall luftskiftinger per time under taket

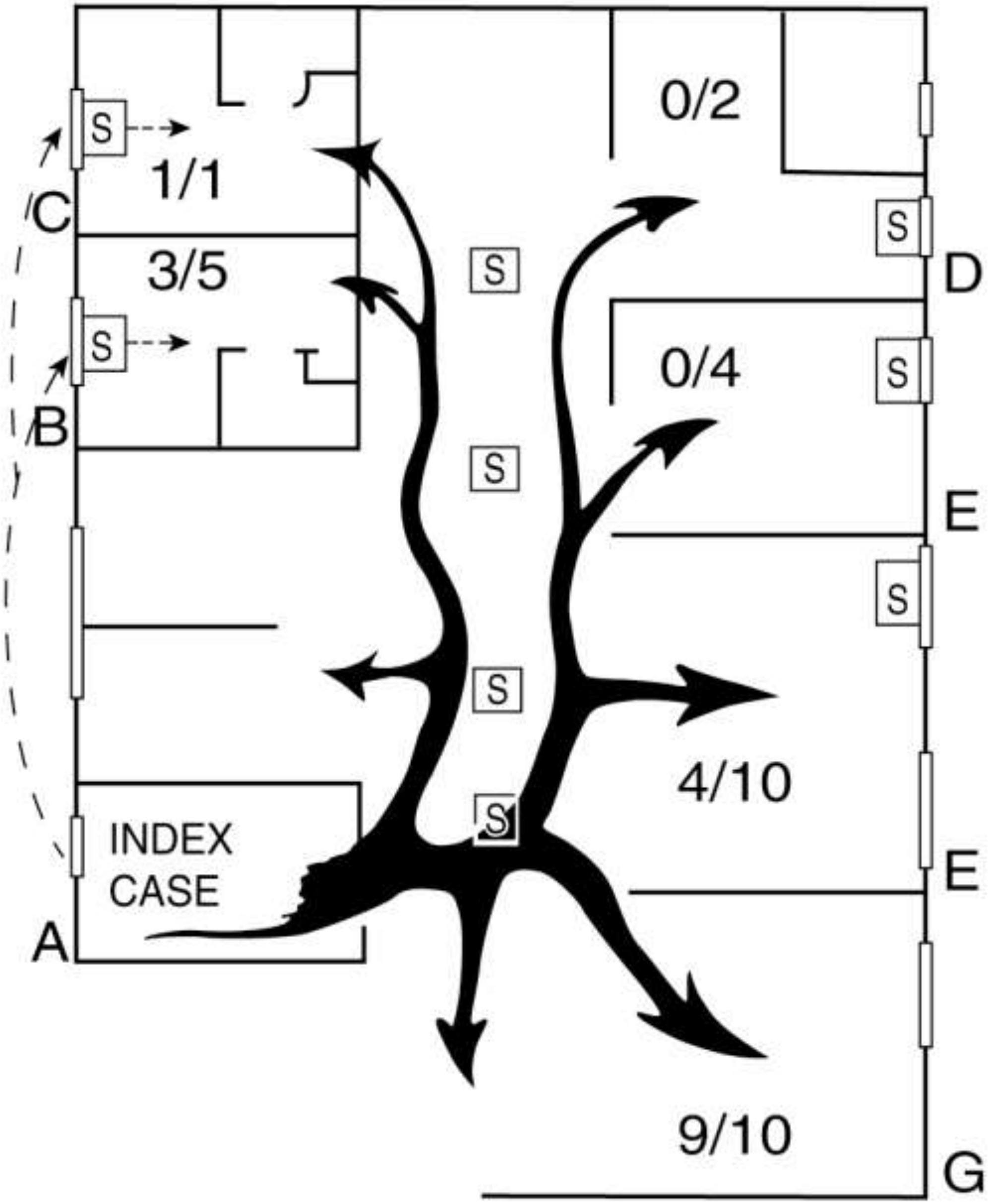


Oppgitt lufthastighet ut gjennom taket



Beregnet lufthastighet ut gjennom taket





Spatial distribution of cases of chickenpox and airflow patterns on ward

Leclair JM et al. NEJM 1980;302:8

Vann og avløp

Amputerte rør etter fjerning av vask/servant

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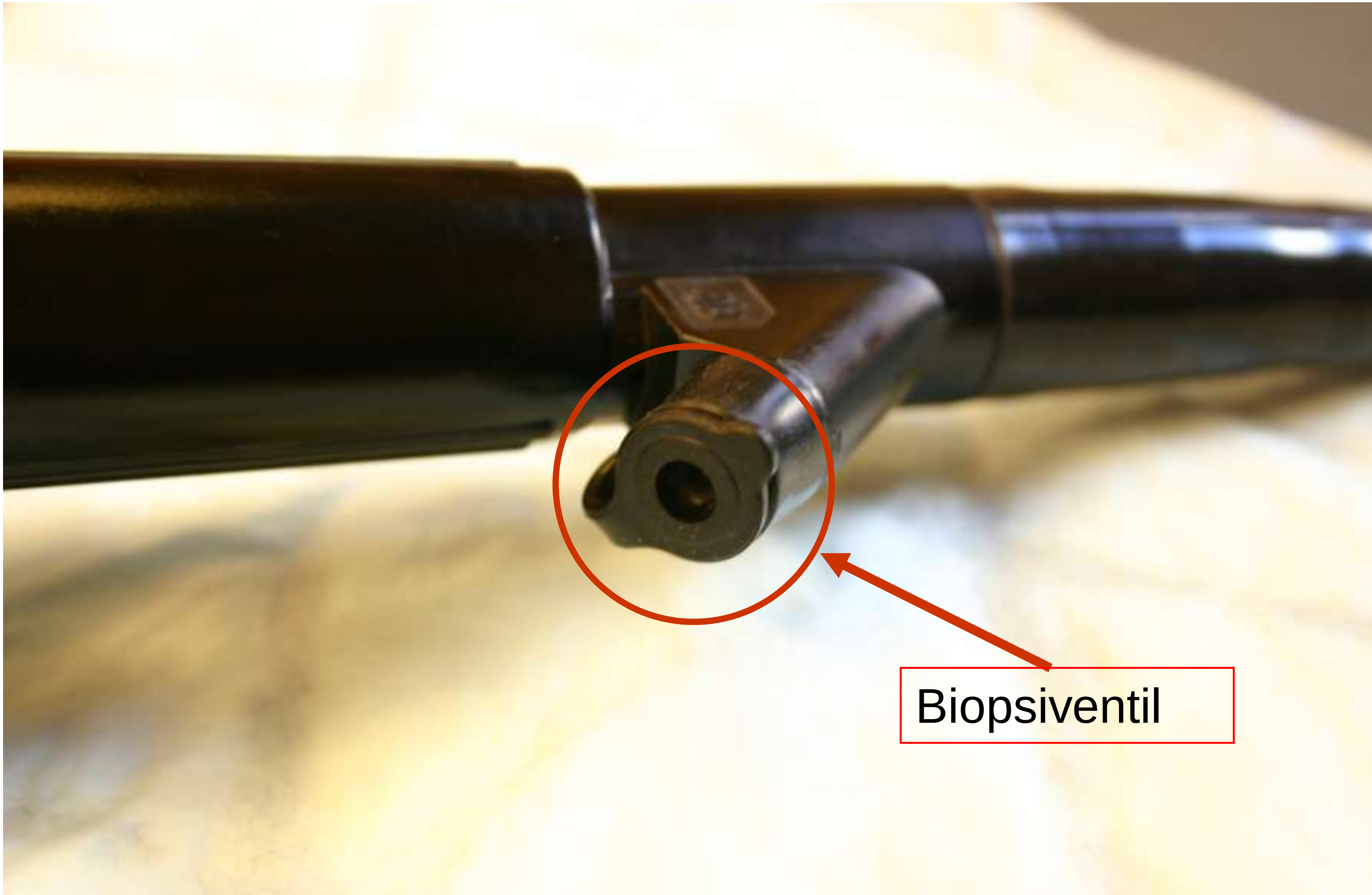
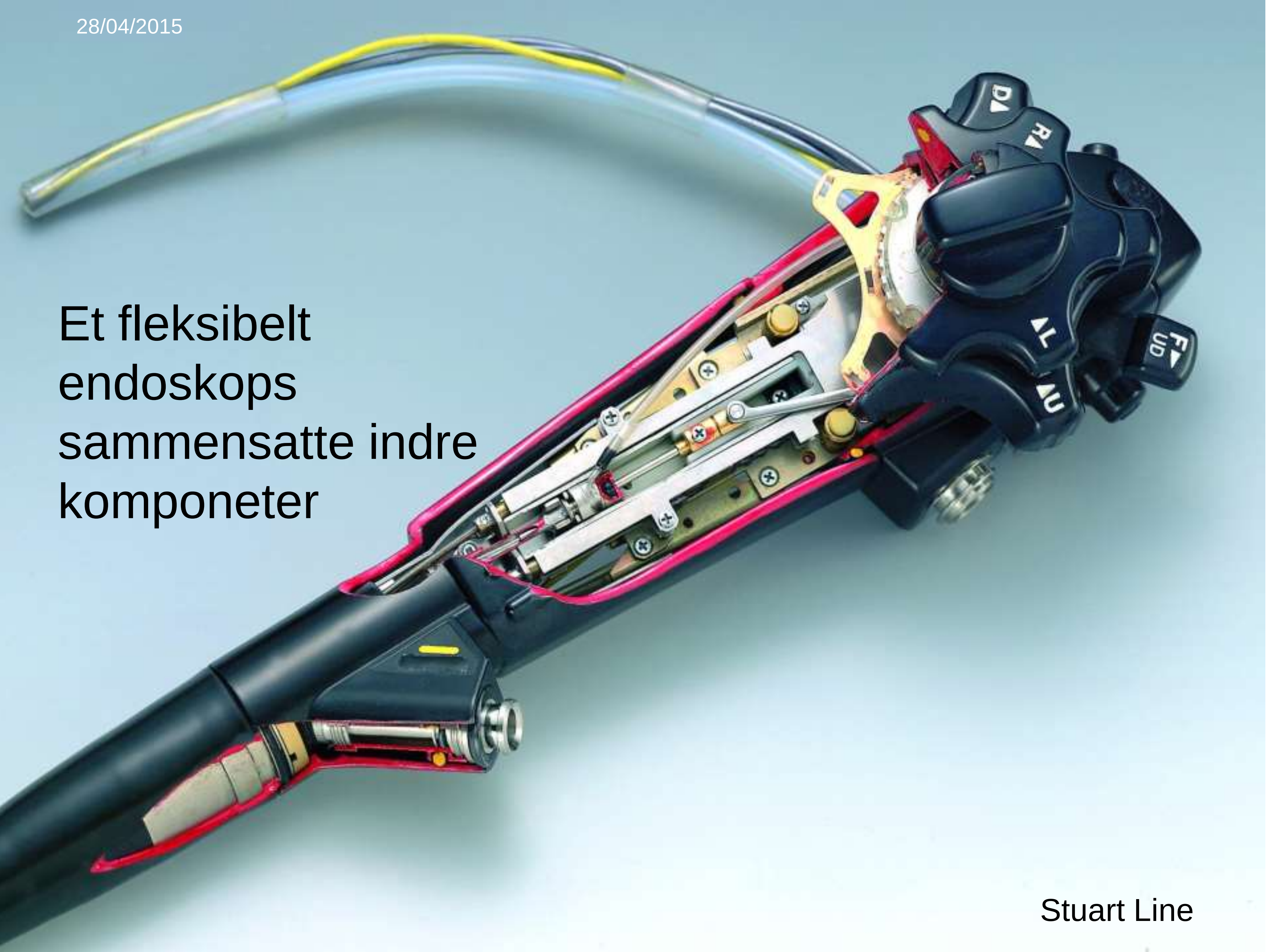
Amputerte rør etter fjerning av vask/servant


Biopsiventil

Duodenoskop (ERCP)

"The device from hell"



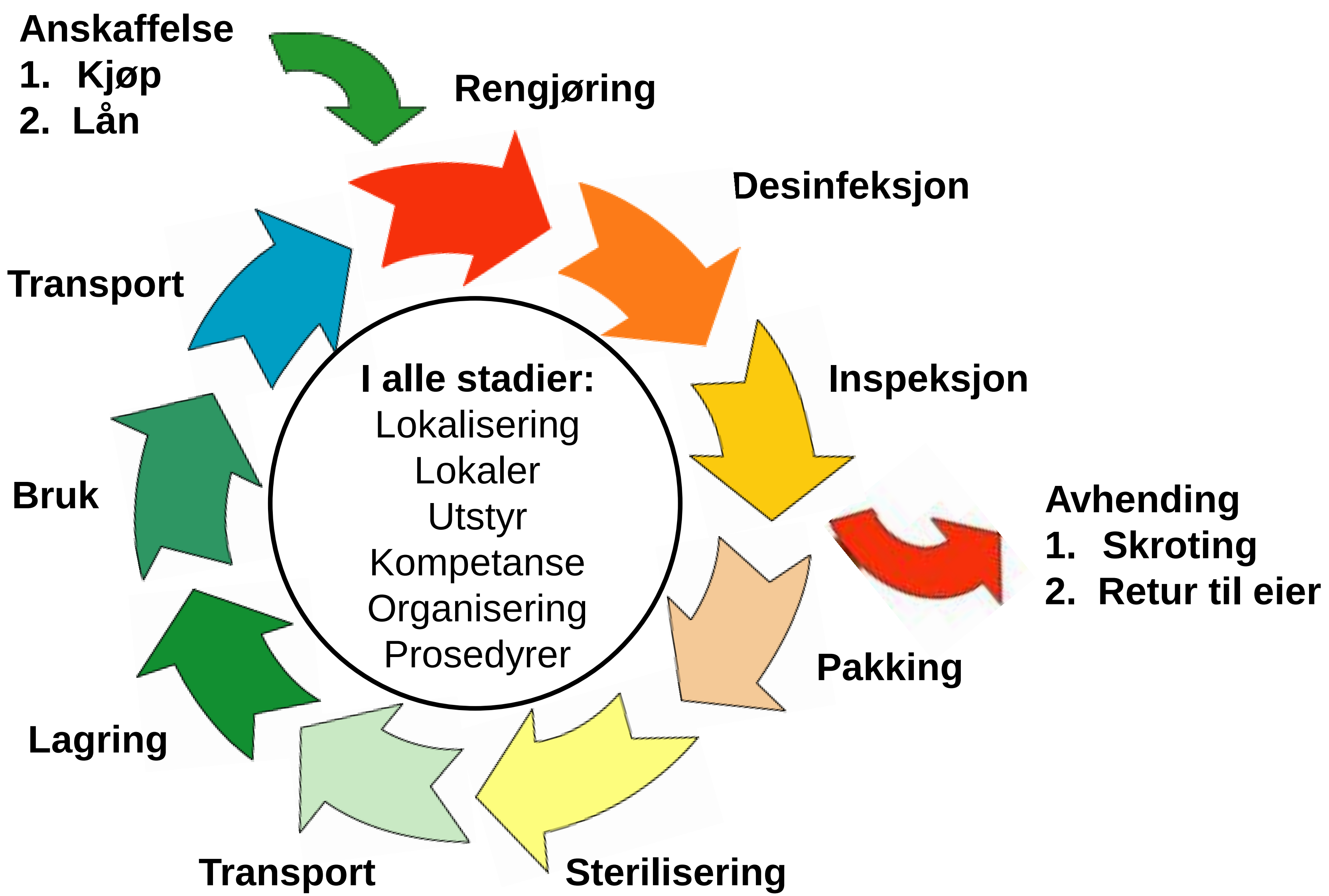
Et fleksibelt endoskops sammensatte indre komponeter

Stuart Line

Endoskopets indre ventilsystem

Stuart Line

Livssyklus for medisinsk flergangsutstyr




RIDGID

Ombygninger og rehabilitering


Aspergillus fumigatus


Aspergillus fumigatus

Avfallsbehandling

Utstyr og flater må tåle rengjøring og desinfeksjon

- Elektronikk
- Plastmaterialer

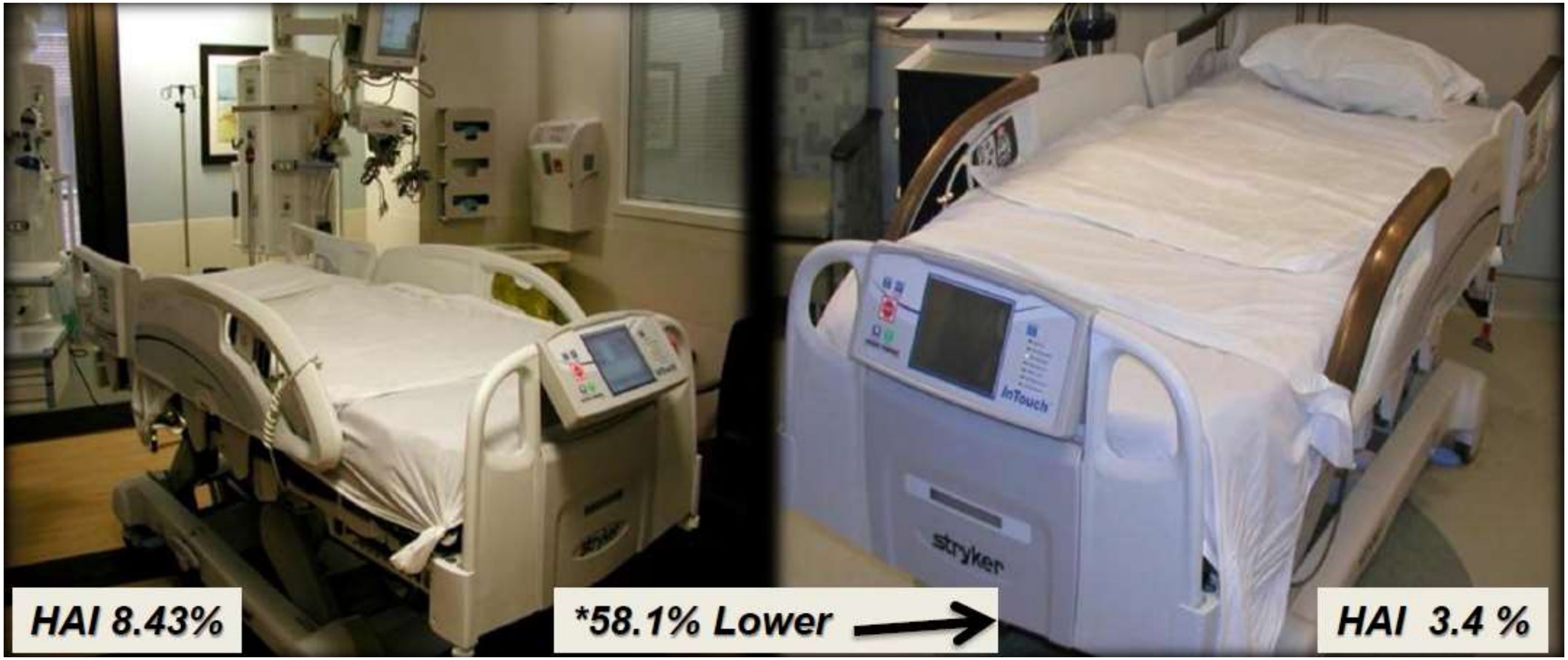
Materialer og design

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY MAY 2013, VOL. 34, NO. 5

ORIGINAL ARTICLE

Copper Surfaces Reduce the Rate of Healthcare-Acquired Infections in the Intensive Care Unit

Cassandra D. Salgado, MD;[1] Kent A. Sepkowitz, MD;[2] Joseph F. John, MD;[3] J Robert Cantey, MD;[1] Hubert H. Attaway, MS;[4] Katherine D. Freeman, DrPH;[5] Peter A. Sharpe, MBA;[6] Harold T. Michels, PhD;[7] Michael G. Schmidt, PhD[4]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HAI 3.4 %
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AEM
Journals.ASM.org

Inactivation of Murine Norovirus on a Range of Copper Alloy Surfaces Is Accompanied by Loss of Capsid Integrity

Sarah L. Warnes, Emma N. Summersgill, C. William Keevil
Centre for Biological Sciences, University of Southampton, Southampton, United Kingdom

Norovirus is one of the most common causes of acute viral gastroenteritis. The virus is spread via the fecal-oral route, most commonly from infected food and water, but several outbreaks have originated from contamination of surfaces with infectious virus. In this study, a close surrogate of human norovirus causing gastrointestinal disease in mice, murine norovirus type 1 (MNV-1), retained infectivity for more than 2 weeks following contact with a range of surface materials, including Teflon (polytetrafluoroethylene [PTFE]), polyvinyl chloride (PVC), ceramic tiles, glass, silicone rubber, and stainless steel. Persistence was slightly prolonged on ceramic surfaces. A previous study in our laboratory observed that dry copper and copper alloy surfaces rapidly inactivated MNV-1 and destroyed the viral genome. In this new study, we have observed that a relatively small change in the percentage of copper, between 70 and 80% in copper nickels and 60 and 70% in brasses, had a significant influence on the ability of the alloy to inactivate norovirus. Nickel alone did not affect virus, but zinc did have some antiviral effect, which was synergistic with copper and resulted in an increased efficacy of brasses with lower percentages of copper. Electron microscopy of purified MNV-1 that had been exposed to copper and stainless steel surfaces suggested that a massive breakdown of the viral capsid had occurred on copper. In addition, MNV-1 that had been exposed to copper and treated with RNase demonstrated a reduction in viral gene copy number. This suggests that capsid integrity is compromised upon contact with copper, allowing copper ion access to the viral genome.

Warnes SL et al. Appl Environ Microbiol 2015;81:1085

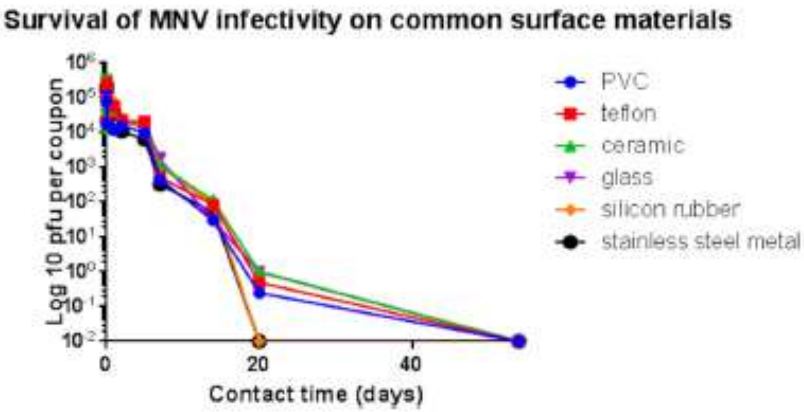

FIG 1 Persistence of infectious murine norovirus on common surface materials. Approximately 5 × 10^5 PFU of infectious virus was applied to 1-cm^2 samples of test surfaces and incubated at room temperature. At various time points, virus was removed from the surfaces and assessed for infectious virus by plaque assay as described in the text. No significant reduction in infectivity of norovirus occurs on any surface over 2 h at room temperature. This was followed by a steady decline in the infectivity of norovirus. Infectious virus was present on all surfaces except stainless steel and silicon rubber at 20 days. However, because the infectious dose was very low (only 10 virus particles), this represents a considerable risk of infection spread. Slightly higher levels of infectious virus were recovered from ceramic surfaces commonly used in bathroom and kitchen tiles. Error bars represent ± standard deviations, and data are from multiple experiments.

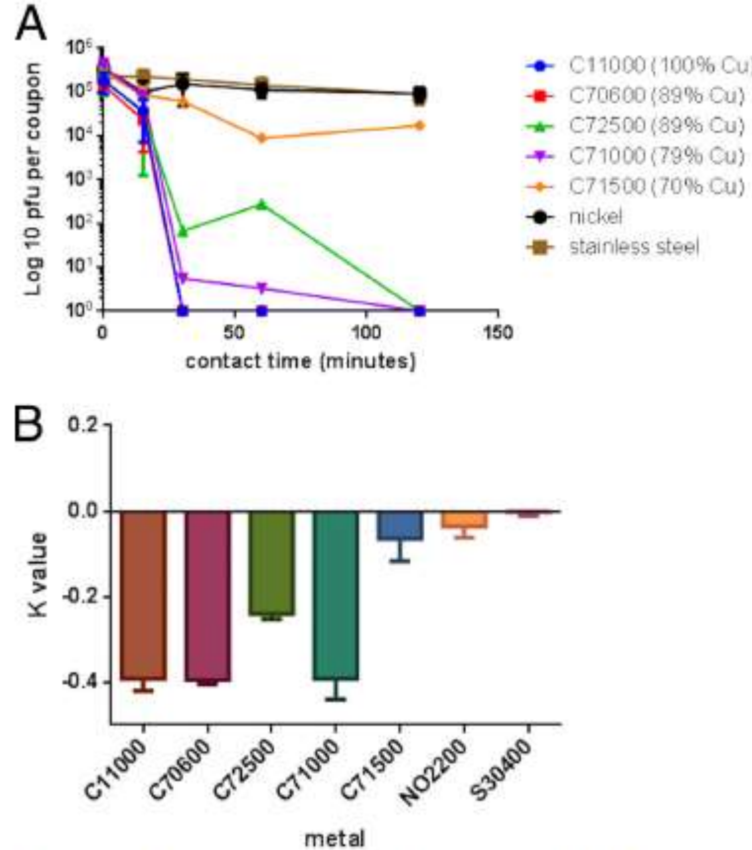

FIG 2 Inactivation of MNV on copper nickels. (A) Survival of MNV infectivity on copper nickels. Approximately 5 × 10^5 PFU of infectious virus was applied to 1-cm^2 samples of test surfaces and incubated at room temperature. At various time points, virus was removed from the surfaces and assessed for infectious virus by plaque assay as described in the text. MNV was rapidly inactivated on copper and C70600. The extent of inactivation on copper alloys was proportional to the percentage of copper, except with alloy C72500, which is not as effective as alloys with lower percentages of copper. Stainless steel and nickel do not have any antiviral activity. (B) Rate of MNV inactivation on copper nickels over the first 30 min of contact at room temperature The inactivation rate, *K*, was calculated as described previously (20). C11000 (100% copper), C70600 (89% copper), and C71000 (79% copper) all displayed similar, fast inactivations of MNV for the first 30 min of contact. Inactivation on C725000 was slower, even though its copper content is high (89%).

Warnes SL et al. Appl Environ Microbiol 2015;81:1085

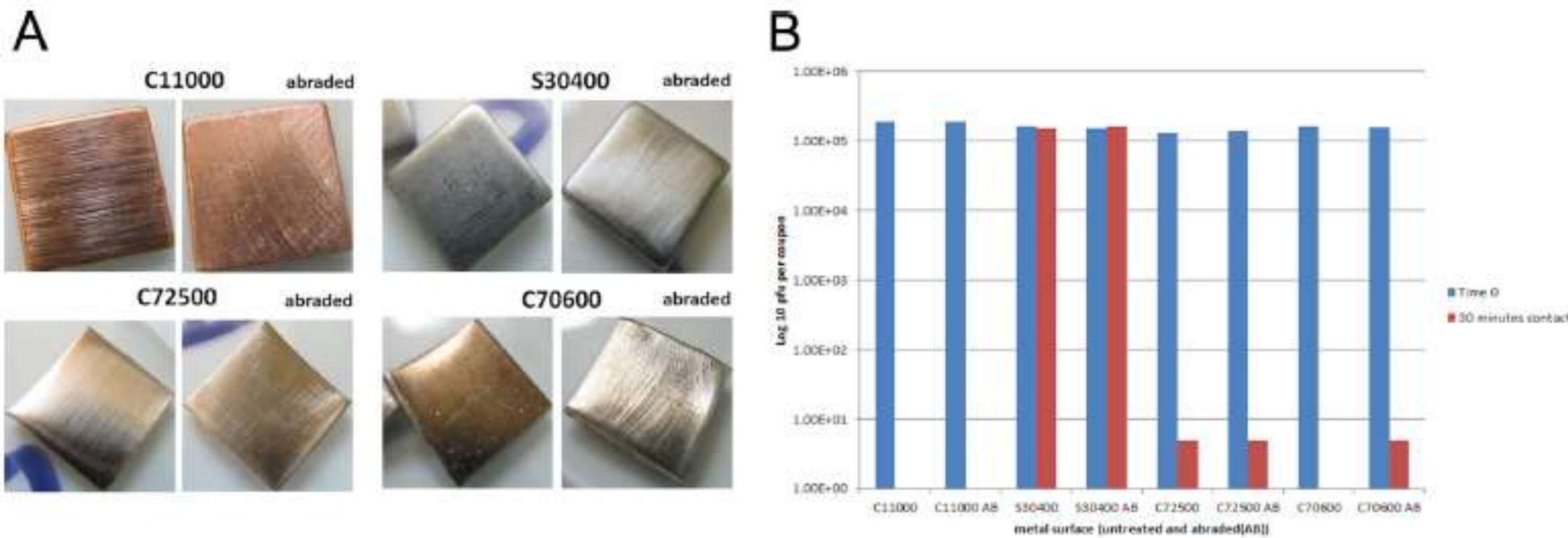

FIG 3 Comparison between two copper nickels, C72500 and C70600) containing 89% copper. (A) Appearance of copper alloys, i.e., abraded and unabraded (copper and stainless steel controls). (B) Abrasion of the oxide layer on C70600 slightly reduces antiviral efficacy. Approximately 5×10^5 PFU of infectious virus was applied to 1-cm^2 samples of abraded and unabraded metal coupons and incubated at room temperature. At various time points, virus was removed from the surfaces and assessed for infectious virus particles by plaque assay as described in the text. Abrading the surface of alloy C72500 did not make any difference in its efficacy in inactivating MNV. It is unclear whether the tin content of this alloy affects efficacy. Abrading the surface of alloy C70600 reduces antiviral efficacy; i.e., the alloy surface has an effect on MNV.

Warnes SL et al. Appl Environ Microbiol 2015;81:1085


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