





Schweizerische Gesellschaft für Sterilgutversorgung Société Suisse de Stérilisation Hospitalière Società Svizzera di Sterilizzazione Ospedaliera

# Effect of fluid flow in cleaning hollow instruments

For the development of a low-cost instrument washer

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17 / 20 NOVEMBER 2021 CICG, GENEVA, SWITZERLAND



#### SMART Project



daroharinden Gaarilachaft für Starfigetouroorgeng 1985 Settere de Stiefenston Henglinghing 1985 Setuere di Starfigeniene Cornistiene

#### SMART Project:

Making minimally invasive surgery applicable to low resource settings through high quality medical devices











Schurcharfeeter Geschlicheft für Starfigetrearcorgene Sachtbil Schne de Mäcklauften Hengligkler Sachtbil Schuren & Darfigzenbare Ospedolisen





**ŤU**Delft







Schurcherinden Geselluckuft, Fir Starfigetrearcorpany Section Series de Médikurjon Herginalise Section Schurge & Darfitzanione Cossidence









#### **Current Solutions**



Schurcherinden Gesetlinden?: För Starfigetrearrongen Sactifik Seriere die Missikantion Henglingelige Secietik Sehaure die Starfiguatione Consciption





J.M.A. Zuijdweg (2014) Cleaning of hollow instruments



CONGRESS





#### Hospitals



Schurcherieder Gesetlicheft, Fit Suzstpatronzongene Septimi Setzen die Missisierine Henglingken Section Schurze & Dierflässelone Dierrichier



















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Prepare patient Clean operating theatre Assist in surgery Post-op care Clean instruments













Schurcharfedes Gaarfinderft Fir Starfigebourcosping Saction Science de Médikasjon Hengikalikes Section Science & Nor-Wassaliere Especiellers









# Equipment



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Schurcherfectus Genetischerft für Sterfligetreurongenig Sachtbil Sicher die Mächlandere Hergelauften Societä Schurer: 47 Nor-Wiczasland Capacitation











Delft

#### **Design Solution**



duorharindes Gaariischaft Fir Starfigetrearongen; 20195 Seitze de Stiefendon Hengligfige 16193 Seitzer: A Storffanginen (Sessiafige)

Design solution:

Low cost, robust laparoscopic instrument cleaner

What are the design requirements? No guidelines could be found in norms and standards











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#### Aim:

# Determine the flow required to remove a test soil from hollow tubes









#### Effect of flow



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- Wall shear stress dominant mechanical force during cleaning
- Wall shear increases with turbulent flow at higher flow speeds













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- Flow speeds
  - Measurements performed in a WD in Rotterdam
  - Flow speeds of 0.3 L/min to 0.9 L/min found in a commercial WD









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- Flow rates between 0 and 8 L/min
  - Laminar to turbulent
- Soaking times
  - 0 5 10 min
- Selection of test soils
  - Egg yolk as a pilot
  - Blood Test Soil (Pfeiffer)







## Effect of Flow Rate



Schucheriedes Geschucheft, Er Sterfigstreurospeng Geschlei Geiene die Meistenione Hergeleiten Societé Schuere & Nor-Recedence Conscionen









### Effect of Flow Rate



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- A high amount of debris can be removed by increasing flow speed
  - Turbulent flow increases debris removal
- The shear stress induced by the flow rate should be taken into account for adequate cleaning of hollow medical instruments









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- Results could be used as cleaning validation
  - Unequal flow distribution
  - Instrument blockages











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- Blood Test Soil (Pfeiffer)
- Use of detergent
- Complex geometry pieces















Schurcherinden Genetischeit. Er Sterfigetrezongenig Genetist Getren die Meistenriche Heistellige Section Schuren die Nor-Michaeligen Dessenbiern



