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11-2013

Latex versus silicone urinary catheter safety: Summary

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Office of Evidence Based Practice – Specific Care Question: Latex vs. Silicone Urinary Catheters

Specific Care Question :

In the child who has a urinary catheter for drainage which catheter, latex or silicone has less cuffing of the catheter balloon when the catheter is removed?

Question Originator:

Kathy Mick, M. Ed, RN, CPN

Plain Language Summary from The Office of Evidence Based Practice: Summary: The latex catheters have less residual balloon cuff after deflation. However, the decision to use silicone catheters was probably made on more than one criterion. The risk of latex allergy in the population we serve and in health care providers is a factor in the decision to use silicone urinary catheters. The best urinary catheter to use will differ based on individual patients.

EBP Scholar's responsible for analyzing the literature:

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EBP team member responsible for reviewing, synthesizing, and developing this literature:

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Search Strategy and Results:

(("Urinary Catheterization/adverse effects"[Mesh] OR "Urinary Catheterization/methods"[Mesh]) AND "Silicones"[Mesh]) AND "Latex"[Mesh]

25 articles were located, and seven were selected by the question originator after reviewing titles and abstracts of the located articles. Seven articles were identified for further analysis. Four of the seven articles are included in this review.

Studies included in this review:

Four studies are included in this review.

- Chung, E., & So, K. (2012). In vitro analysis of balloon cuffing phenomenon: inherent biophysical properties of catheter material or mechanics of catheter balloon deflation? *Surg Innov*, 19(2), 175-180. doi: 10.1177/1553350611399589 1553350611399589 [pii]
- Evans, A., Godfrey, H., & Fraczyk, L. (2001). An audit of problems associated with urinary catheter withdrawal. *Br J Community Nurs*, 6(10), 511-512, 514-516, 518-519. doi: <ARTICLE_ID IdType=""/> [pii]
- Lawrence, E. L., & Turner, I. G. (2006). Kink, flow and retention properties of urinary catheters part 1: conventional foley catheters. *J Mater Sci Mater Med*, 17(2), 147-152. doi: 10.1007/s10856-006-6818-0
- Parkin, J., Scanlan, J., Woolley, M., Grover, D., Evans, A., & Feneley, R. C. (2002). Urinary catheter 'deflation cuff' formation: clinical audit and quantitative in vitro analysis. *BJU Int*, 90(7), 666-671. doi: 3014 [pii]

Studies not included in this review with rationale for exclusion:

Study identifier	Reason for exclusion
Gonzalgo & Walsh (2003)	Narrative review
Hardwicke, Jones & Wilson-Jones (2010)	Does not answer the question
Robinson (2003)	Nursing skills paper

Method Used for Appraisal and Synthesis:

The Critical Appraisal Skills Programme (CASP) and Oxman A. D., Cook D. J., Guyatt G. H., *Users' guides to the medical literature*. VI. How to use an overview. *JAMA* 1994; 272 (17): 1367-1371

Created: August 28 2013 Updated: November 5 2013

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Synthesis of relevant studies:

Author, date, country, and industry of funding	Patient Group	Level of Evidence (Oxford) / Strength of Evidence (GRADE)	Research design	Significant results	Limitations
Chung & So, 2012	A total of 300 urinary catheters Silicone Bardex (Bard, Covington, GA) Bard-Lubri-Sil(Bard, Covington, GA) Argyle (Tyco, Argyle, NY) Releen (Coloplast, Mount Waverley, Australia) Hydrogel-coated latex catheter Biocath (Bard, Covington, GA)	Bench study	10 ml of sterile water was used to inflate the catheter balloon Each catheter was immersed in 1. sterile urine 2. E.Coli inoculated urine media at body tem for 1, 14, and 28 days During each study interval time 20 urinary catheters of each material were deflated with one of the four different methods of deflation (5 each) 1. active deflation of balloon- deflated within 5 seconds 2. passive deflation very slow active deflation over 30 seconds 3. passive auto-deflation by attaching an empty syringe and allow for gentle auto deflation 4. excision of the balloon inflow	Catheter balloon volume loss:- the greatest amount of volume loss was with Bardex (silicone coated latex), the least volume loss was with the Releen (silicone) catheter Catheter type and cuffing: Bardex, Argyle, and Biocath showed greater degree of catheter balloon cuffing than Bard-Lubri-Sil and Releen. Bardex had the most significant amount of cuffing (100%)by 28, and cuffing was most pronounced in the infected urine media Argyle and Biocath had 80% cuffing that was worse in the infected media Balloon Deflation methods: At day 1, 14 and 28 of catheterization, there was no difference in the degree of balloon cuffing. There was a significant increase in balloon cuffing as catheters were deflated at day 1, 14 and 28. Infected urine media did not significantly increase balloon cuffing compared to sterile urine.	Bench study- <i>in vitro</i> technique

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Evans, Godfrey, & Fraczyk, 2001	One questionnaire was completed for each subject who had a long term indwelling catheter, in situ for > 28 days	Level 4 cohort	An audit questionnaire was sent to 37 nursing units in West England	154 questionnaires were returned. Catheter type Hydrogel- N= 129 (84%) All silicone catheters N = 20 (13%) PTFE (Teflon coated catheters) N= 5 (3%) Problems with removal N=22 (14%) had problems with catheter removal All silicone catheters N=15 (68% of the 22 with removal problems)	Survey. Do not know status of non-responders.
Parkin et al., 2002	Laboratory follow up to Evans (Evans, et al., 2001) above 12 catheters studied, 3 hydrogel coated latex, and the rest silicone from 3 brands	Bench study A profilometer was used to measure the pressure of a suprapubic tract. Force measurements of 0.5N were applied at intervals of 30s until the friction force was overcome and the tube removed from the apparatus.	An <i>in vitro</i> study	The friction forces were similar among catheters. Retention forces were greater by up to 200% in the all silicone catheters compared to the hydrogel coated latex catheters.(1.5-3 N (Newtons))	<i>In vitro</i>

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<p>Lawrence & Turner, 2006</p>	<p>Laboratory, no human subjects</p>	<p>Bench study Three types of commercially available urinary catheters were tested.</p>	<p>Kinkability was tested by manometer Retention was measured with force required to remove the catheter from a “retention rig”</p>	<p>The all-silicone device had superior resistance to kinking and better flow properties than the latex-based catheters. However, greater retention forces were recorded for the all-silicone device, in both the inflated and deflated condition, indicating that much more force would be required to remove the this type of catheter.</p>	<p><i>In vitro</i></p>
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