Well connected is well protected

MaxPlus™Clear
IV connector

CareFusion

Features only matter if they deliver results

Catheters provide a vital lifeline for those such as oncology and trauma patients in critical need of reliable venous access[1]

As the gatekeeper, catheter connectors should provide access without acting as an avenue for microbial contamination[2]

In the past 20 years there has been an explosion of needleless connectors, with a confusing array of internal and external design features[3]

To differentiate between devices it is essential to consider not only the intended purpose of these differing features, but also their achieved results

*Center for Disease Control

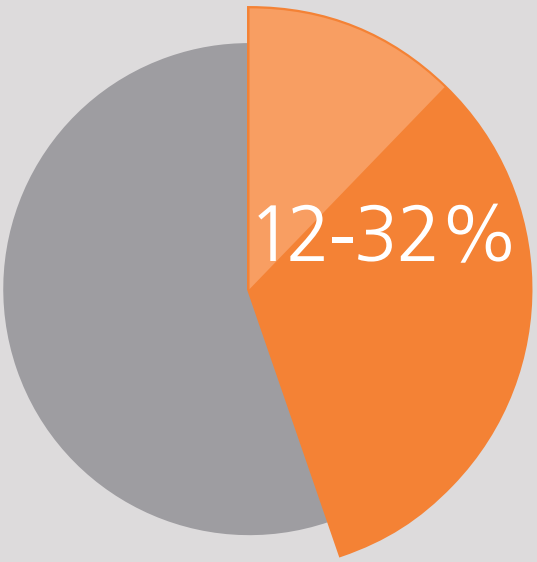
References: 1. Pieters P *et al.* Venous catheters: A practical manual. Thieme Medical Publishers, New York, 2003. 2. Macklin D. Semin Oncol Nurs 2010; 26: 113-20. 3. Hadaway L, Richardson D. J Infus Nurs 2010; 33: 22-31.

Catheter-associated complications originating inside the catheter lumen have important consequences for patient and healthcare provider alike:[4]

- they can result in the delay or disruption of infusion therapy
- they may slow the patient's progress toward therapeutic goals
- they may even worsen the severity of the patient's underlying ill health
- they can increase length of stay and cost of care

Catheter-related bloodstream infections (CRBSI) are not only among the most costly of hospital-acquired infections they are among the most dangerous[5-8]

Reported CRBSI mortality rates[6-8]



MaxPlus™ is referred to in the CDC* guidelines as contributing to significantly reduced CRBSI rates when used with other bundled interventions[9]

MaxPlus™ Clear was designed to support healthcare professionals in reducing the risk of catheter-associated complications when used in conjunction with other best practice interventions[10]

References: 4. Hadaway L. J Assoc Venous Access 2011; 16: 20-33. 5. Plowman R *et al.* The socio-economic burden of hospital acquired infection. www.doh.gov.uk. 6. Tacconelli E *et al.* J Hosp Infect 2009; 72: 97-103. 7. Rebmann T *et al.* Am J Infect Control 2010; 38: 846-8. 8. Burlaud A *et al.* Arch Gerontol Geriat 2010; 51: e106-e109. 9. O'Grady N *et al.* Clin Infec Dis 2011; 52: e1-e32. 10. McCord J. Poster presented at 24th Annual Scientific Meeting of the Association for Vascular Access, Washington DC, September 2010.

The results are clear case histories – the bottom line

In a 350-bed acute adult care facility

The hospital was already implementing Institute for Healthcare Improvement (IHI) best practice interventions and using chlorhexidine impregnated disks before the introduction of MaxPlus™ Clear in January 2007[1]

CRBSI redundant rate (per 1000 central line days)[1]

Prior to the introduction of MaxPlus™ Clear

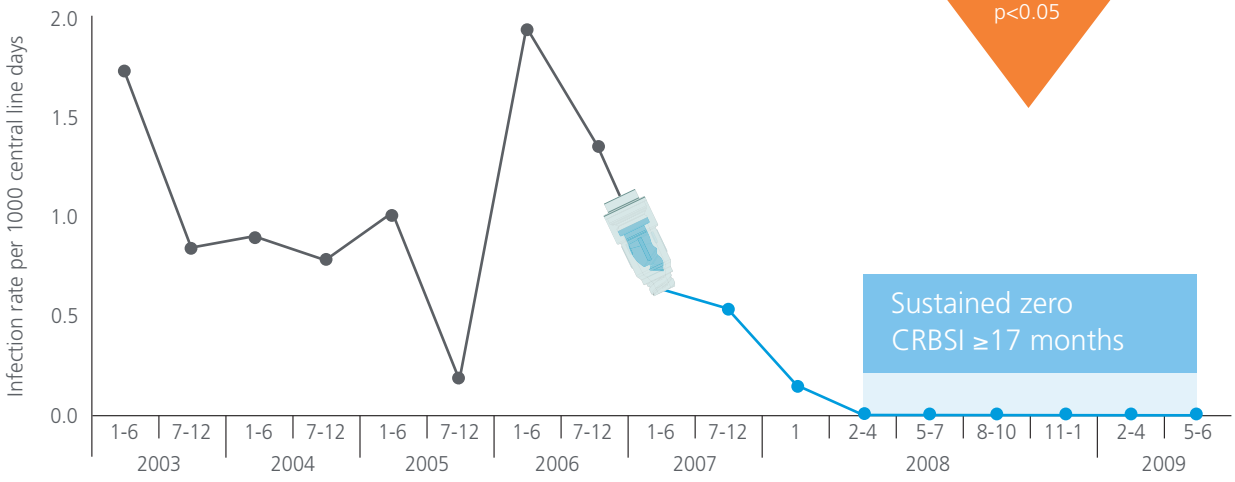
0.63

After the introduction of MaxPlus™ Clear

0.00

100% reduction

p<0.05



"Cost savings were calculated for the 6-month period of January 2007 through June 2007 to be $241,000 for the ICUs alone[1]"

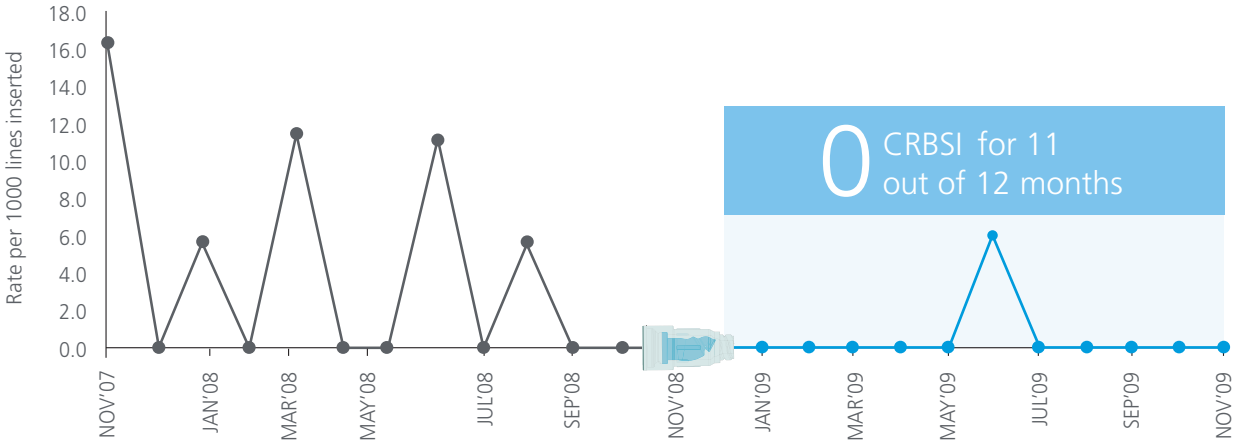
Getting to zero

References: 1. Royer T. J Infus Nurs 2010; 33: 398-406. 2. McCord J. Poster presented at 24th Annual Scientific Meeting of the Association for Vascular Access, Washington DC, September 2010.

In a US acute care facility

The hospital was already implementing IHI best practice interventions before the introduction of MaxPlus™ Clear in November 2008, use of which resulted in:[2]

- a **66.7%** reduction in occlusions
- a **56.5%** reduction in alteplase use
- an **81.1%** reduction in CRBSI
- improved patient outcomes
- annual savings exceeding **$500,000**



Key components of IHI guidelines:

- hand hygiene
- maximal barrier precautions upon insertion
- chlorhexidine skin antisepsis
- optimal catheter site selection
- daily review of line necessity

Getting to zero catheter-associated complications

MaxPlus™ Clear
the growing evidence base

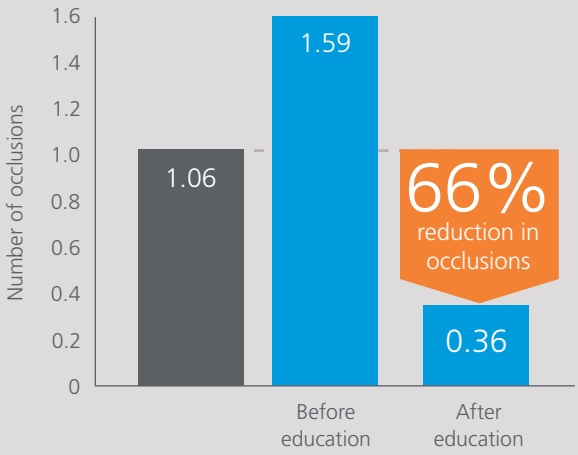
Use of MaxPlus™ Clear connectors and other best practice interventions – presented abstracts, published studies and reports[1]

Previous device	Study	CRBSI rate before MaxPlus™ Clear	CRBSI rate after introducing MaxPlus™ Clear	reduction in CRBSI rate
Positive displacement mechanical valve	1	6.3	0.4	94%
	2	5.6	0.58	89%
	3	2.3	0	100%
	4	1.955	0.369	81%
Negative displacement mechanical valve	5	1.76	1.24	30%
	6	0.18	0.04	78%
	7	4.08	0	100%
Negative displacement antimicrobial mechanical valve	8	2.86	0.46	84%
Cannula activated split septum negative displacement device	9	2.3	1.5	35%

Getting to zero

Reference: 1. Data on file. CareFusion ML-3146.

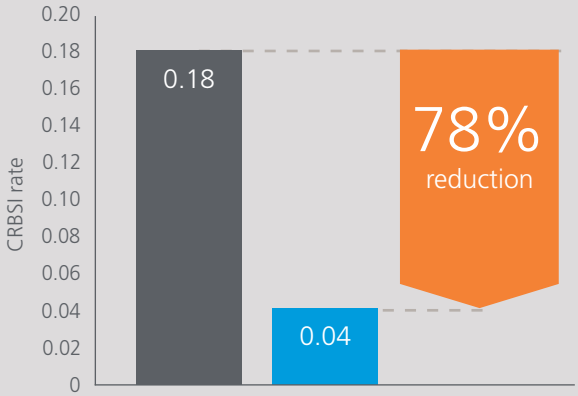
A study conducted by a home care association recognised a 66% reduction in occlusions when combined with IHI guidelines[2]



There appears to be a close association between catheter-related thrombosis and catheter-related infection, and as such it behooves healthcare professionals to utilise strategies to prevent both[3]

Mechanical valve MaxPlus™ Clear

And a 78% reduction in CRBSI from after implementation of MaxPlus™ Clear[2]



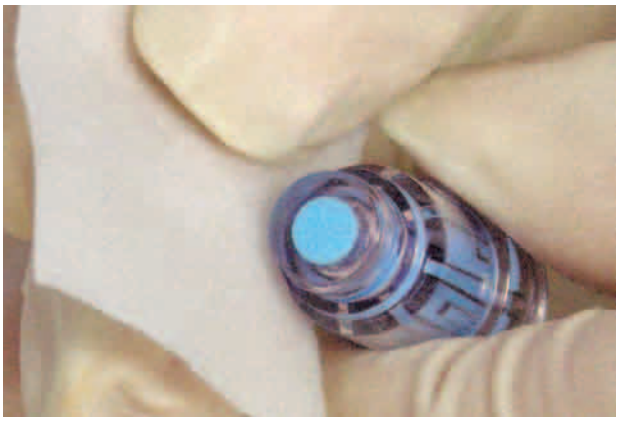
Mechanical valve MaxPlus™ Clear

References: 2. Cain D, Jones G. Comparison of Catheter Occlusions Between a Mechanical Valve Injection Cap and Positive Displacement Injection Cap. NHIA Poster 2010. 3. Nakazawa N. Semin Oncol Nurs 2010; 26: 121-31.

MaxPlus™ Clear features only matter if they deliver results

Zero crevices[1]

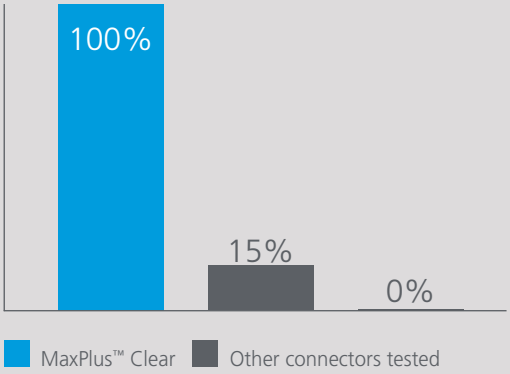
a flat, smooth, easy-to-scrub surface helps reduce the risk of bacterial ingress



- Free from crevices which can harbour bacteria and potentially contribute to CRBSIs[2]
- MaxPlus™ Clear creates a complete seal that enables healthcare professionals to effectively "scrub the hub"[1,2]

MaxPlus™ Clear allows optimal connector hub disinfection

Efficacy in preventing passage of contamination after microbial challenge[3]



"The findings suggest that there is a difference in the microbial barrier properties of commercially available LADs*[3]"

Getting to zero

*luer activated device

References: 1. Royer T. J Infus Nurs 2010; 33: 398-406. 2. McCord J. Poster presented at 24th Annual Scientific Meeting of the Association for Vascular Access, Washington DC, September 2010. 3. Lange V. Am J Infect Control 2009; 37: E182-E183.

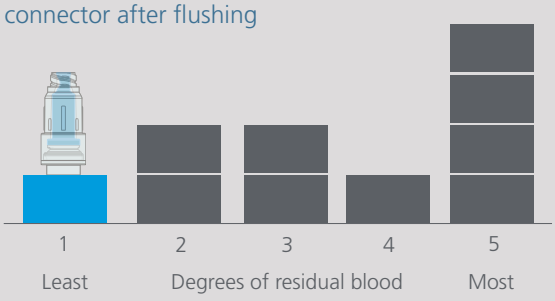
Zero dead space[4]

one internal piece and a simple fluid path helps reduce the opportunity for occlusions and the potential risk of bloodstream infections

- During aspiration, blood attaches to the catheter surface and encourages the production of fibrin[5]
  - if intraluminal fibrin build-up is not minimised, catheter occlusion can occur[6]
- As well as enhancing the risk of infection, occlusion adds to expense (thrombolytics, additional x-rays etc.), may interrupt therapy, and may result in catheter removal[6]
- Connectors with multiple moving parts or corrugations have dead spaces, which act as reservoirs where debris is deposited but cannot be reached with any method of flushing, fostering growth of microbial contaminants[7]

With its simple fluid path, of 10 devices inspected, MaxPlus™ Clear was found to have the least blood remaining in the connector after flushing[7]

Visual rating of blood remaining in connector after flushing



Each connector was dissected lengthwise and photographed after 10 ml of blood had been drawn through it followed by a flush with 10 ml of normal saline

In a blood clearance analysis, one 5 ml flush cleared 99.34% of residual haemoglobin from MaxPlus™ Clear; after a second 5 ml flush, no haemoglobin remained[4]

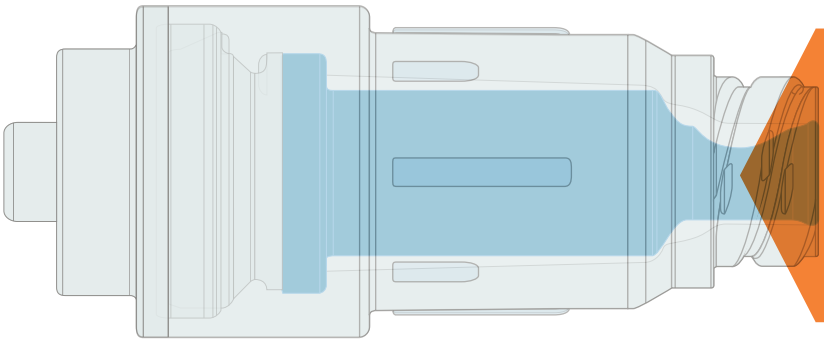
References: 4. Data on file. CareFusion ML-3131. 5. Nakazawa N. Semin Oncol Nurs 2010; 26: 121-31. 6. Macklin D. Semin Oncol Nurs 2010; 26: 113-20. 7. Lange V. Am J Infect Control 2009; 35: E41-E42.

MaxPlus™ Clear
features only matter if they deliver results

Zero places to hide[1,2]

clear housing allows healthcare professionals to see the effectiveness of their own technique and to promptly correct less effective flushing[1,2]

- The opaque housing of most devices prevents visual confirmation of a complete flush[3]
- If blood remains in the connector there is an increased risk of:
  - occlusion[4]
  - CRBSI[4]



MaxPlus™ Clear allows healthcare professionals to see the effectiveness of their own technique and to promptly correct less effective flushing[1,2]

Because the fluid path can be clearly seen, the MaxPlus™ Clear connector also acts as a visual reminder to complete best practice priming, scrubbing and flushing[2]

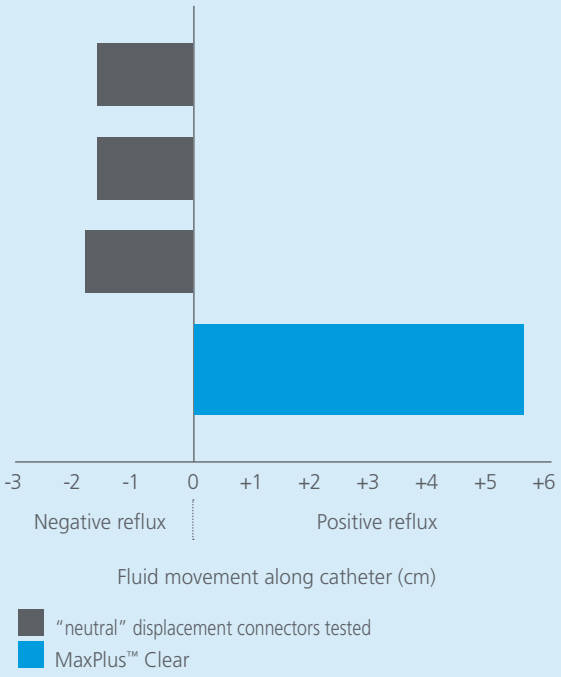
Getting to zero

References: 1. McCord J. Poster presented at 24th Annual Scientific Meeting of the Association for Vascular Access, Washington DC, September 2010. 2. Royer T. J Infus Nurs 2010; 33: 398-406. 3. Jarvis WR. Infection Control Today 2010; 8: 1-3. 4. Jarvis WR *et al.* Clin Infect Dis 2009; 49: 1821-7.

Zero reflux[5]

reflux prevention on syringe disconnection stops blood from backing up into the catheter and contributing to occlusion

- Reflux from connectors, after a syringe is disconnected, is also a major contributor to intraluminal fibrin build-up[6]
- When the syringe is disconnected, the single piece inside MaxPlus™ Clear returns to its original position. This automatically pushes the fluid out of the tip of the catheter, preventing blood coming back which could lead to occlusions[7]



"…even though neutral LADs may have reduced negative pressure, our clinical results indicate that this reduction is not sufficient to prevent increased incidences of intraluminal clot formation[7]"

References: 5. Data on file. CareFusion ML-3131. 6. Macklin D. Semin Oncol Nurs 2010; 26:113-20. 7. Schotte A. Poster presented at the Infusion Nurses Society 2008.

Well connected is well protected

Zero crevices[1,2]

with a flat, smooth, easy-to-scrub surface

Healthcare professionals can effectively "scrub the hub", minimising the risk of bacterial ingress

Zero dead space[3]

with a simple fluid path

No reservoirs where blood can escape out of the reach of effective flushing

Zero places to hide[1,3]

with clear housing

A visual reminder to complete best practice priming, scrubbing and flushing

Zero reflux[4]

with reflux prevention on syringe disconnection

Helping to prevent catheter occlusion with its associated costs and risks

Getting to Zero[1-5]

catheter-related complications

The MaxPlus™ Clear has been shown to significantly decrease occlusions and help sustain a zero CRBSI rate when used in conjunction with other best practice interventions

Getting to zero

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To contact your local office go to:
www.carefusion.com/contact

References: 1. McCord J. Poster presented at 24th Annual Scientific Meeting of the Association for Vascular Access, Washington DC, September 2011. 2. Royer T.J Infus Nurs 2010; 33: 398-406. 3. Data on file. CareFusion ML-3131. 4. Cain D, Jones G. Comparison of Catheter Occlusions Between a Mechanical Valve Injection Cap and Positive Displacement Injection Cap. NHIA Poster 2011. 5. O'Grady N *et al.* Clin Infec Dis 2011; 52: e1-e32.