

MEDICO-ECONOMIC APPROACH TO MIDLINE CATHETERS

COMPARATIVE STUDY :
MIDLINES VERSUS
PIVS VERSUS
PICCS

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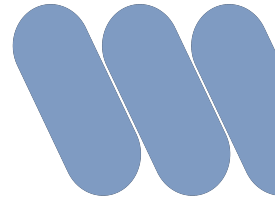
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LINKS OF INTEREST



Dr ROSAY

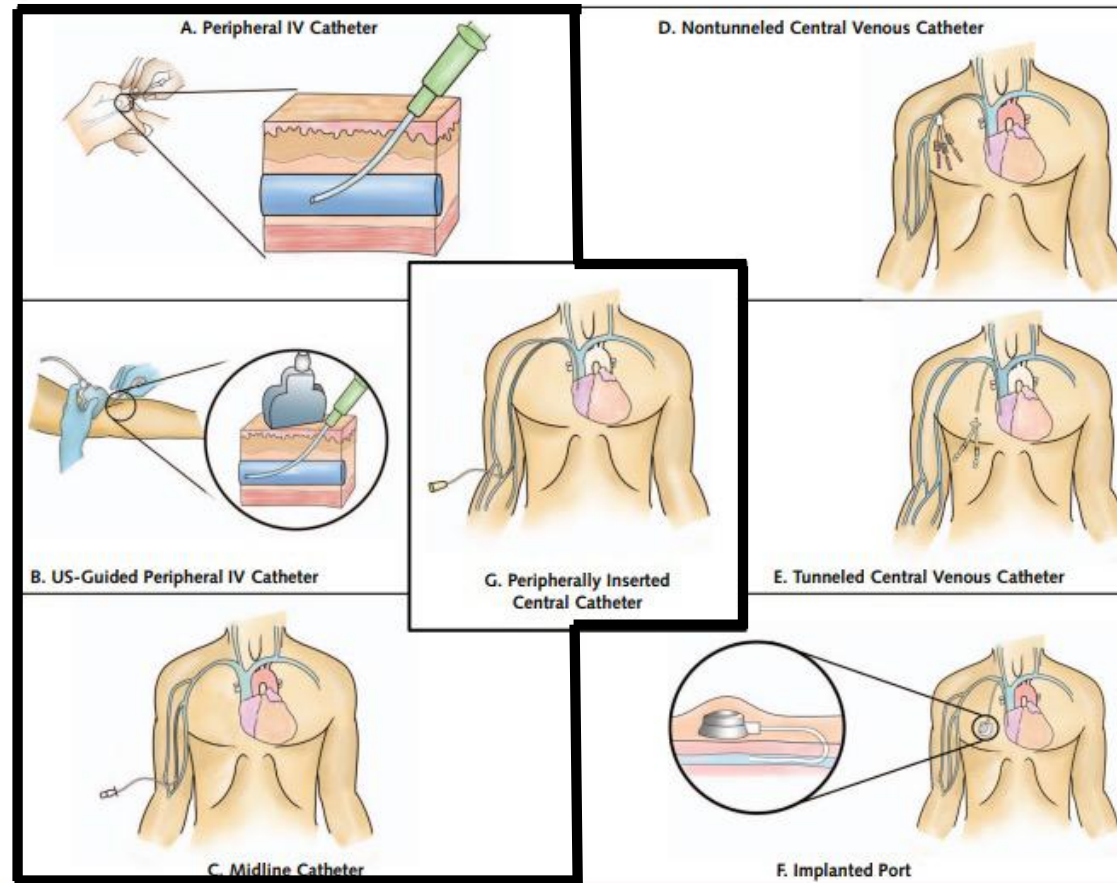
- BD
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DIFFERENT DEVICES: PERIPHERAL INFUSATE COMPATIBLE

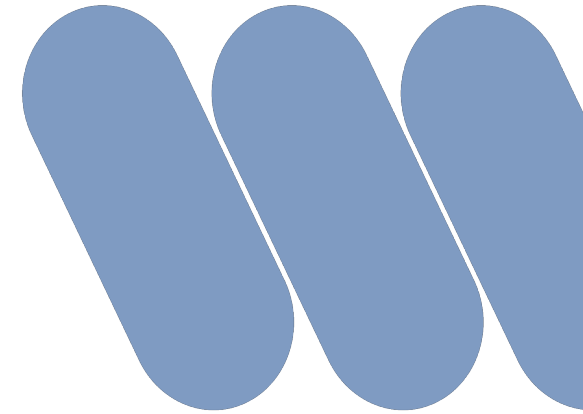


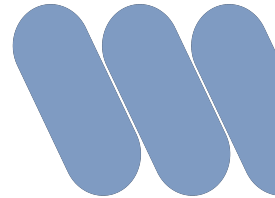


PERIPHERAL INFUSATE COMPATIBLE

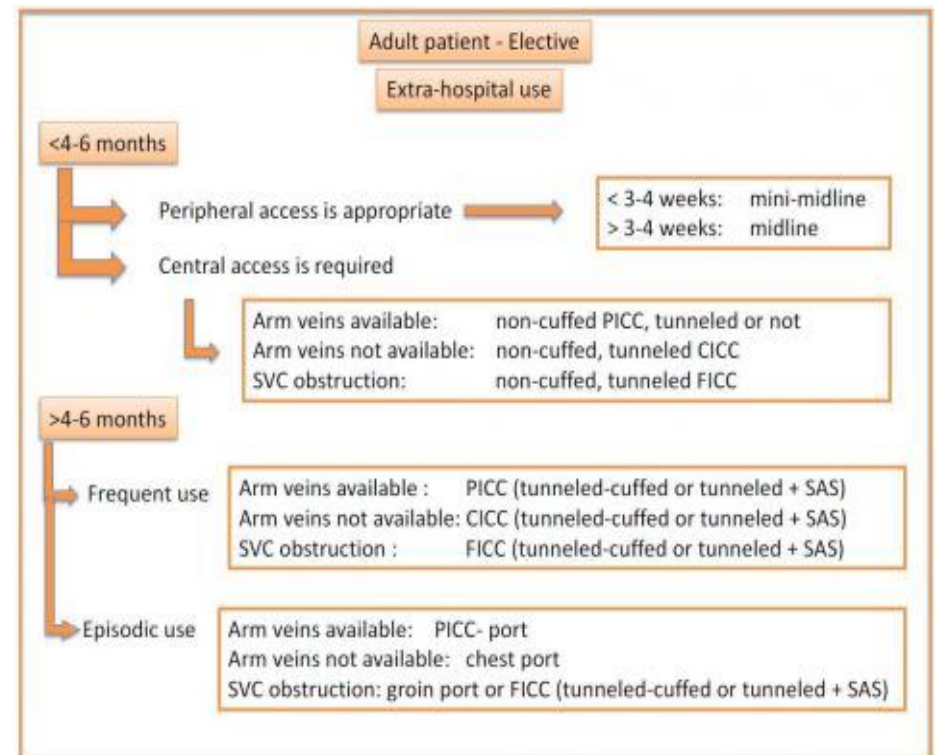
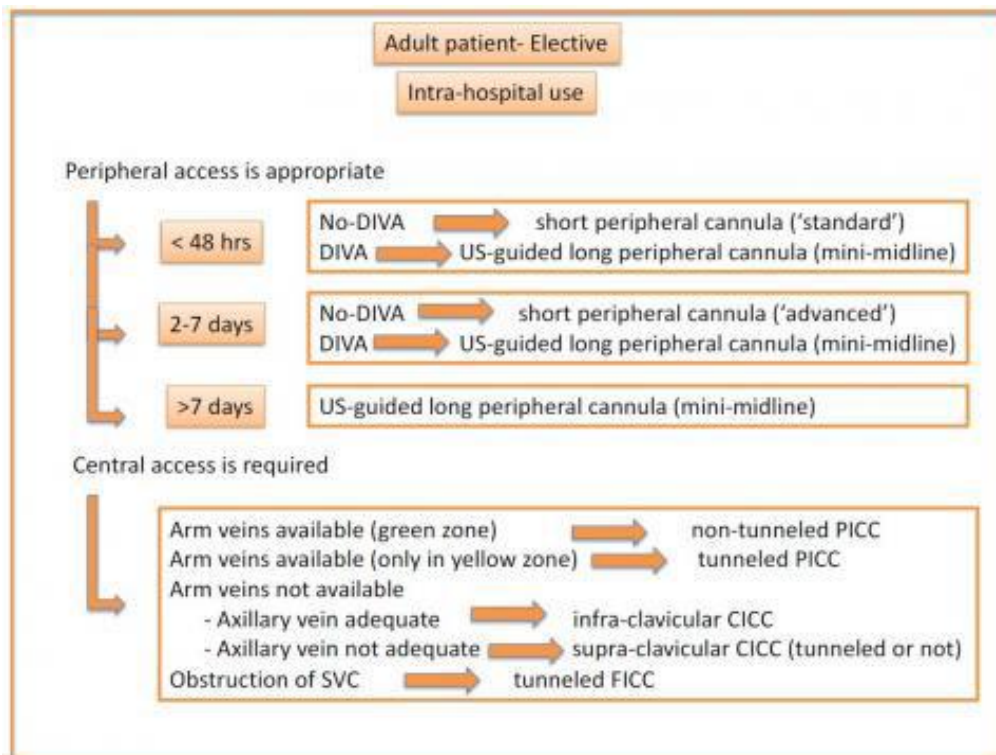
CHOOSING THE BEST CATHETER IS DIFFICULT

- Treatment compatible.
- Length of treatment
- Complications
- Nuanced guidelines





GAVECELT



PERIPHERAL INFUSATE COMPATIBLE

Figure 3. Venous access device recommendations for infusion of peripherally compatible infusate.

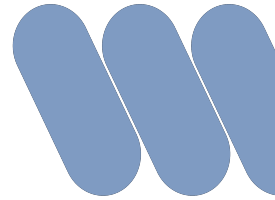
Device Type	Proposed Duration of Infusion			
	≤5 d	6–14 d	15–30 d	≥31 d
Peripheral IV catheter	No preference between peripheral IV and US-guided peripheral IV catheters for use ≤5 d			
US-guided peripheral IV catheter	US-guided peripheral IV catheter preferred to peripheral IV catheter if proposed duration is 6–14 d			
Nontunneled/acute central venous catheter	Central venous catheter preferred in critically ill patients or if hemodynamic monitoring is needed for 6–14 d			
Midline catheter	Midline catheter preferred to PICC if proposed duration is ≤14 d			
PICC		PICC preferred to midline catheter if proposed duration of infusion is ≥15 d		
Tunneled catheter				PICC preferred to tunneled catheter and ports for infusion 15–30 d
Port				

Appropriate

Neutral

Inappropriate

Disagreement



PROTOCOL MICHIGAN USA

Annals of Internal Medicine

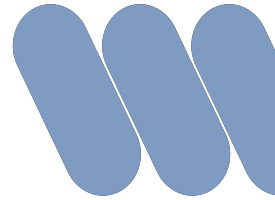
SUPPLEMENT

The Michigan Appropriateness Guide for Intravenous Catheters (MAGIC): Results From a Multispecialty Panel Using the RAND/UCLA Appropriateness Method

Vineet Chopra, MD, MSc; Scott A. Flanders, MD; Sanjay Salot, MD, MPH; Scott C. Woller, MD; Naomi P. O'Grady, MD; Nasir Saffar, MD, PhD; Scott O. Trerotola, MD; Rajiv Saran, MD, PhD; Nancy Moureau, BSN, RN; Stephen Wiseman, PharmD; Mauro Pittinelli, MD; Elie A. Akl, MD, MPH, PhD; Agnes Y. Lee, MD, MSc; Anthony Courtney, MD; Lakshmi Swaminathan, MD; Jack LeDonne, MD; Carol Becker, MHA; Sarah L. Krein, PhD, RN; and Steven J. Bernstein, MD, MPH

06/12/2022

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CDC 2011

Patient requiring 6 or more days of IV therapy should be assessed for a PICC or midline. **(Category 1B)**



Guidelines for the Prevention of
Intravascular Catheter-Related
Infections, 2011

Naomi P. O'Grady, M.D.¹, Mary Alexander, R.N.², Lilian A. Burns, M.T., M.P.H., C.L.C.³ E.

INS 2021

Patient requiring 6-14 days of IV therapy should be assessed for a midline. For those requiring more 14 days consider CVC; Midline may remain appropriate **(S74-6)**

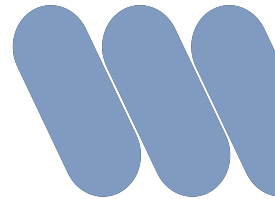
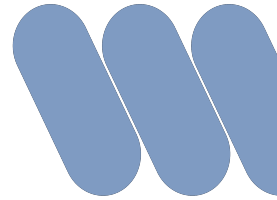
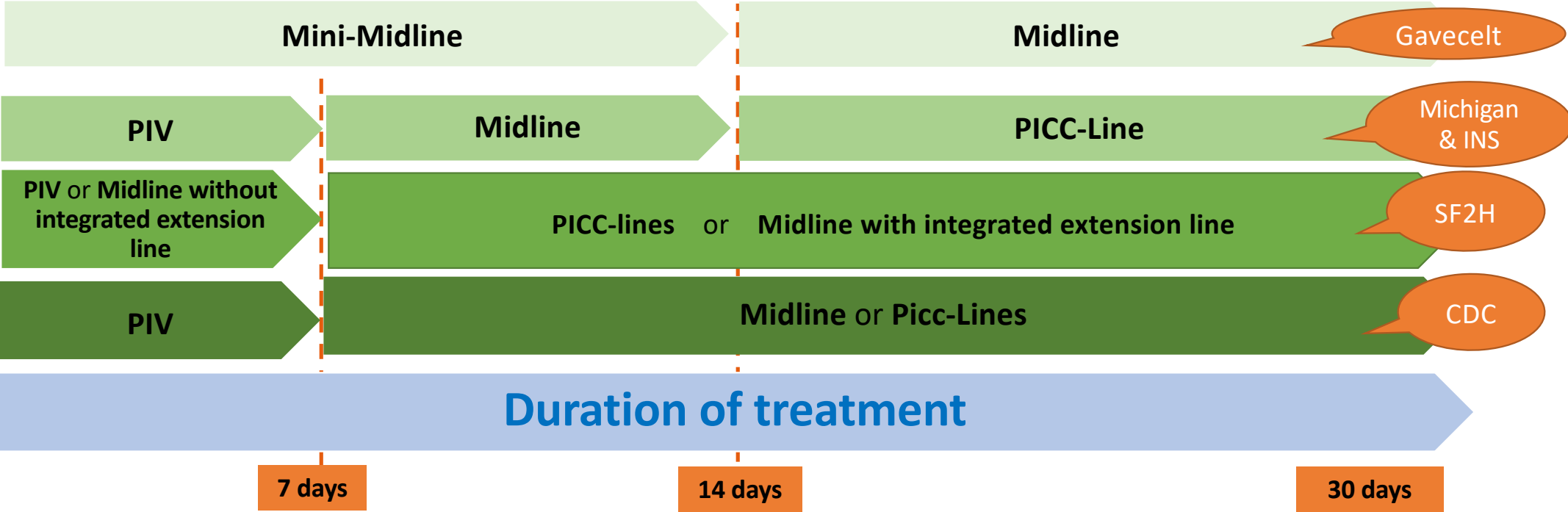


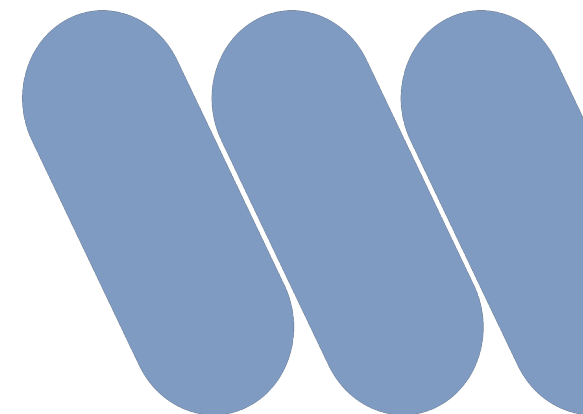
Tableau I – Arbre décisionnel pour le choix d'un accès vasculaire.

1. Quel traitement ?	Toxicité du traitement à perfuser									
	Produit non irritant et non vésicant <900 mOsm/l Abord périphérique possible					Produit irritant ou vésicant Abord central nécessaire				
						Débit de perfusion élevé (>5 ml/s) ?				
						Non		Oui		
2. Quelle durée ?	Durée d'implantation prévisionnelle					Durée d'implantation prévisionnelle			Durée d'implantation prévisionnelle	
	7 jours	8 à 14 jours	15 à 30 jours	≥31 jours	≤14 jours	15–30 jours	≥31 jours	≤1 mois	>1 mois	
3. Dispositif de première intention	Capital veineux ?									
	Bon	Mauvais ¹	Midline avec prolongateur intégré ou PICC	PICC	PICC	PICC	PICC ou CVC tunnalisé avec ou sans manchon	PICC ou CVC tunnalisé ou Chambre à cathéter implantable	CVC	CVC tunnalisé avec ou sans manchon
Alternative		Midline sans prolongateur intégré	CVC en USI	Midline avec prolongateur intégré	CVC tunnalisé ou chambre à cathéter Implantable	CVC en USI				



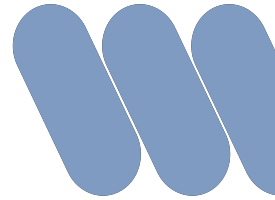
OVERVIEW OF GUIDELINES



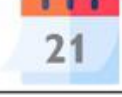


IS MEDICO-ECONOMIC APPROACH ABLE TO HELP THE PHYSICIAN TO CHOOSE THE BEST CATHETER?

Not only the price of devices
But the cost of placement & the costs of complications



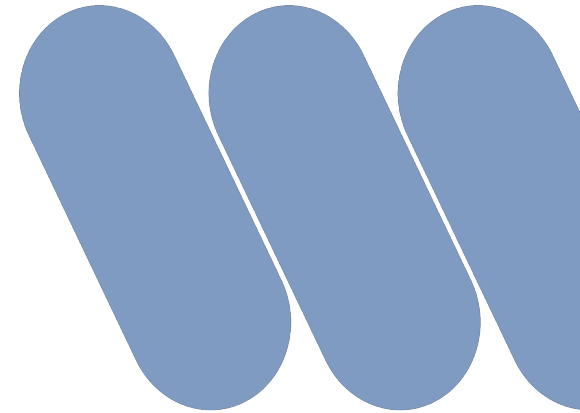
3 DIFFERENT CLINICAL SITUATIONS

Duration of the therapy (days)	Catheter			Indication
	PIV	Midline	PICC	
 7	☒	☒		Peritonitis 
 14	☒	☒	☒	Cystic fibrosis 
 21		☒	☒	Meningitis 

Cost of device, cost of placement.

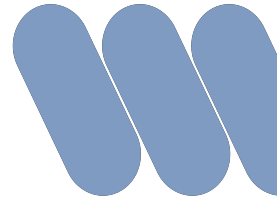
Cost of complications:

Treatment, Replacement of the device, Nursing time, Length of stay...

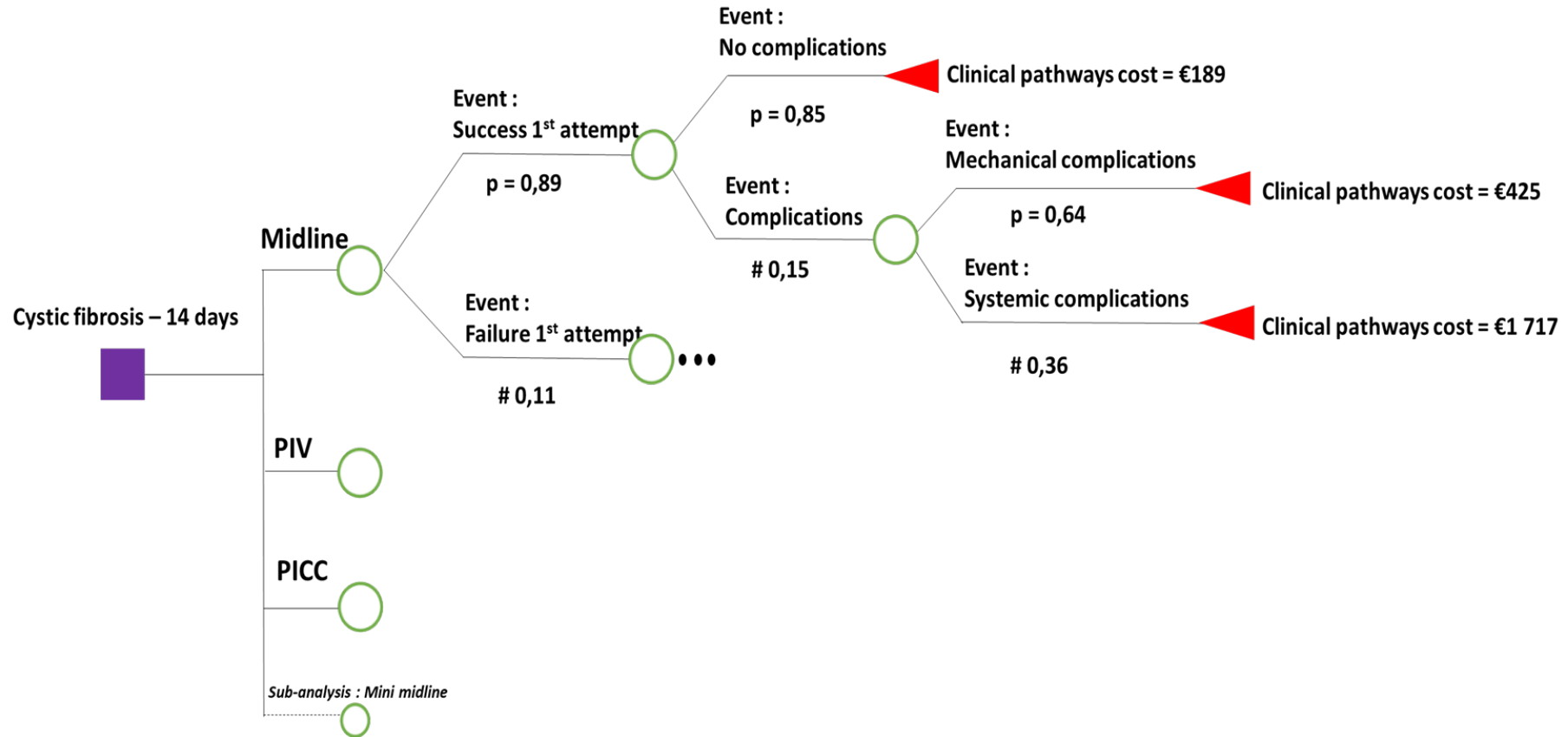


METHODS

Economic assessment	Budget impact analysis (only cost)		
Perspective	Hospital perspective		
Decision modeling	Decision trees		
Time horizon	Cross section		
Comparators (devices)	PIV – Midline – PICC		
Length of treatment (days)	7	14	21
	<i>Peritonitis</i>	<i>Cystic fibrosis</i>	<i>Meningitis</i>



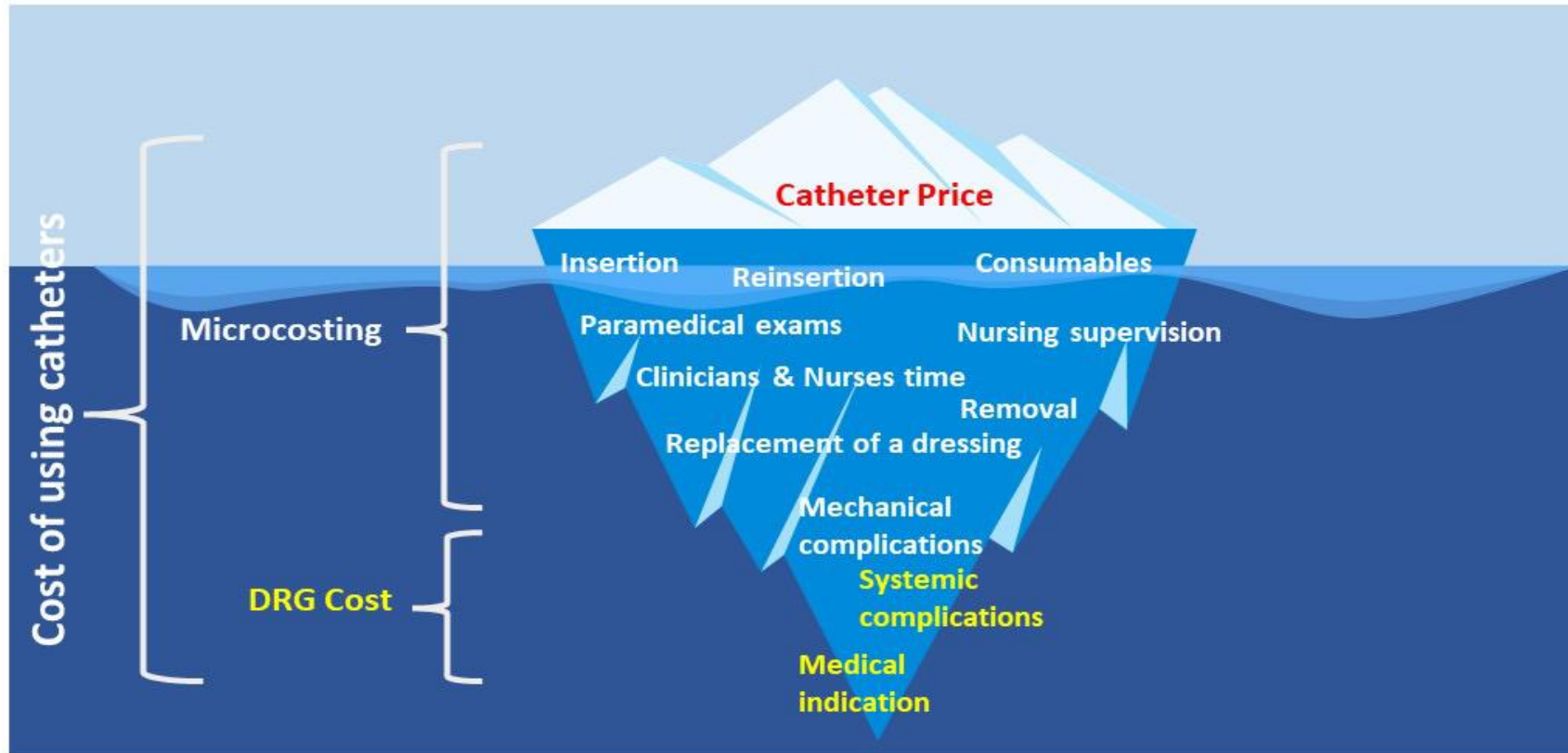
DECISION TREES



MODEL INPUT PARAMETERS - OCCURRENCE OF COMPLICATIONS (FREQUENCIES FROM A LITERATURE REVIEW)

<i>Complications Catheters</i>	PIV	Midline	PICC	Mini-Midline
<i>Systemic complications</i>				
Thrombosis	12,50% (Elia 2012)	4,10% (Tripathi 2021)	1,50% (Swaminathan 2021)	1,40% (Swaminathan 2021)
Bloodstream infection	0,1% (Maki 2006)	0,4% (Maki 2006)	1,8% (Swaminathan 2021)	0,4% (Swaminathan 2021)
Pulmonary embolism	0%	1,65% (Bahl 2019)	0,2% (Swaminathan 2021)	0,2% (Bahl 2019)
<i>Mechanical complications</i>				
Dislodgment	7,30% (Helm 2015)	5% (Tripathi 2021)	1,50% (Piredda 2020)	5% (Tripathi 2021)
Infiltration	32% (Rickard 2012)	1,9% (Tripathi 2021)	0% (Xu 2020)	1,9% (Tripathi 2021)
Catheter occlusion	22,80% (Helm 2015)	3,8% (Tripathi 2021)	5,8% (Swaminathan 2021)	2,1% (Swaminathan 2021)

MODEL INPUT PARAMETERS – COST VALUATION



UNIT COSTS PER CATEGORY

	PIV	Midline	PICC	Mini-Midline
Insertion <i>(consumables, device, clinicians & nurses time, paramedical exams)</i>	€6,50	€111,17	€160,09	€95,17
Reinsertion (after failure) <i>(consumables, device, clinicians & nurses time, paramedical exams)</i>	€4,48	€98,83	€135,76	€82,83
Nursing supervision <i>(nurses time)</i>	€4,50	€4,50	€4,50	€4,50
Dressing repair <i>(consumables, nurses time)</i>	-	€17,55	€17,55	€17,55
Removal <i>(nurses time)</i>	€2,25	€2,25	€2,25	€2,25
Mechanical complications	€21	€226,61	€253	€199,89
Systemic complications	€796, 43	€1 534,39	€1 789,38	€1 589,42



RESULTS



MIDLINE VS PIV: 7-DAY TREATMENT

	ESTIMATED COST PER PATIENT & PER PERIOD		INCREMENTAL COST
	MIDLINE	PIV	MIDLINE vs PIV
Micro-costing			
<i>Consumables</i>	€32,63	€5,40	€27,23
<i>Device</i>	€60,19	€1,94	€58,25
<i>Clinicians & Nurses time</i>	€42,42	€42,68	- €0,27
<i>Paramedical exams</i>	€15,76	€0,00	€15,76
<i>Mechanical complications</i>	€11,09	€37,35	- €26,25
Micro-costing total (I)	€162,09	€87,38	+ €74,71
DRG Cost			
<i>Ex : medical indication peritonitis</i>	€3 679,18	€3 679,18	€0,00
<i>Systemic complications</i>	€41,32	€239,99	- €198,67
Total DRG Cost (II)	€3 720,50	€3 919,17	- €198,67
Grand General (I)+(II)	€3 881,94	€4 006,31	- €123,95

MIDLINE VS PIV VS PICC: 14-DAY TREATMENT

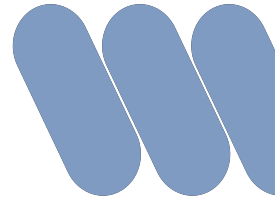
	ESTIMATED COST PER PATIENT & PER PERIOD			INCREMENTAL COST	
	MIDLINE	PIV	PICC	MIDLINE vs PIV	MIDLINE vs PICC
Micro-costing					
<i>Consumables</i>	€45,66	€8,39	€45,71	€37,27	- €0,05
<i>Device</i>	€60,19	€3,02	€66,28	€57,17	- €6,09
<i>Clinicians & Nurses time</i>	€78,36	€75,45	€93,08	€2,92	- €14,71
<i>Paramedical exams</i>	€15,76	€0,00	€49,69	€15,76	- €33,93
<i>Mechanical complications</i>	€22,42	€59,35	€23,06	- €36,92	- €0,64
Micro-costing total (I)	€222,39	€146,20	€277,81	+ €76,20	- €55,42
DRG Cost					
<i>Ex : medical indication Cystic fibrosis</i>	€10 775,16	€10 775,16	€10 775,16	€0,00	€0,00
<i>Systemic complications</i>	€80,86	€368,84	€62,48	-€287,97	€18,38
Total DRG Cost (II)	€10 856,02	€11 144	€10 837,64	-€287,97	+€18,38
Grand GENERAL (I)+(II)	€11 078,42	€11 290,20	€11 115,46	- €211,78	- €37,04

MIDLINE VS PICC: 21-DAY TREATMENT

	ESTIMATED COST PER PATIENT & PER PERIOD		INCREMENTAL COST
	MIDLINE	PICC	MIDLINE vs PICC
Micro-costing			
<i>Consumables</i>	€58,69	€58,73	- €0,04
<i>Device</i>	€60,19	€66,28	- €6,09
<i>Clinicians & Nurses time</i>	€114,31	€128,99	- €14,68
<i>Paramedical exams</i>	€15,76	€49,69	- €33,93
<i>Mechanical complications</i>	€25,60	€23,30	€2,30
Micro-costing total (I)	€274,55	€327	- €52,45
DRG Cost			
<i>Ex : medical indication meningitis</i>	€9 286,52	€9 286,52	€0,00
<i>Systemic complications</i>	€94,23	€62,48	€31,75
Total DRG Cost (II)	€9 380,75	€9 349	+ €31,75
Grand GENERAL (I)+(II)	€9 655,30	€9 676	- €20,70

MINI-MIDLINE VS PIV: 7-DAY TREATMENT

	ESTIMATED COST PER PATIENT & PER PERIOD		INCREMENTAL COST
	MINI MIDLINE	PIV	MIDLINE vs PIV
Micro-costing			
<i>Consumables</i>	€32,63	€5,40	€27,23
<i>Device</i>	€41,67	€1,94	€39,73
<i>Clinicians & Nurses time</i>	€42,42	€42,68	- €0,27
<i>Paramedical exams</i>	€15,76	€0,00	€15,76
<i>Mechanical complications</i>	€10,29	€36,40	- €26,11
Micro-costing total (I)	€162,09	€86,43	+ €56,34
DRG Cost			
<i>Ex : medical indication peritonitis</i>	€3 679,18	€3 679,18	€0,00
<i>Systemic complications</i>	€31,74	€239,99	- €208,25
Total DRG Cost (II)	€3 710,92	€3 919,17	- €208,25
Grand GENERAL (I)+(II)	€3 853,69	€4 005,60	- €151,91



MINI-MIDLINE VS PIV VS PICC: 14-DAY TREATMENT

	ESTIMATED COST PER PATIENT & PER PERIOD			INCREMENTAL COST	
	MINIMIDLINE	PIV	PICC	MINIMIDLINE vs PIV	MINIMIDLINE vs PICC
Micro-costing					
Consumables	€45,66	€8,39	€45,71	€37,27	- €0,05
Device	€41,67	€3,02	€66,28	€38,65	- €6,09
Clinicians & Nurses time	€78,36	€75,45	€93,08	€2,92	- €14,71
Paramedical exams	€15,76	€0,00	€49,69	€15,76	- €33,93
Mechanical complications	€16,62	€58,62	€23,02	- €42,01	- €6,40
Micro-costing total (I)	€197,07	€144,07	€277,78	+ €52,59	- €79,70
DRG Cost					
Ex : medical indication Cystic fibrosis	€10 775,16	€10 775,16	€10 775,16	€0,00	€0,00
Systemic complications	€31,74	€368,84	€62,48	-€337,10	€30,74
Total DRG Cost (II)	€10 806,90	€11 144	€10 837,64	-€337,10	+€30,74
Grand GENERAL (I)+(II)	€11 004,97	€11 289,48	€11 115,42	- €284,51	- €110,45

MINI-MIDLINE VS PICC: 21-DAY TREATMENT

	ESTIMATED COST PER PATIENT & PER PERIOD		INCREMENTAL COST
	MINIMIDLINE	PICC	MINIMIDLINE vs PICC
Micro-costing			
<i>Consumables</i>	€58,69	€58,73	- €0,04
<i>Device</i>	€41,67	€66,28	- €24,61
<i>Clinicians & Nurses time</i>	€114,31	€128,99	- €14,68
<i>Paramedical exams</i>	€15,76	€49,69	- €33,93
<i>Mechanical complications</i>	€18,43	€23,22	€4,79
Micro-costing total (I)	€248,86	€326,91	- €78,06
DRG Cost			
<i>Ex : medical indication meningitis</i>	€9 286,52	€9 286,52	€0,00
<i>Systemic complications</i>	€31,74	€62,48	€30,74
Total DRG Cost (II)	€9 318,26	€9 349	+ €30,74
Grand GENERAL (I)+(II)	€9 567,12	€9 675,92€	- €108,80

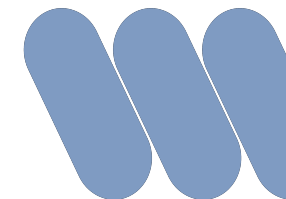
CONCLUSIONS

Midline is cheaper ! (Per patient & per period)

7 days	14 days		21 days
PIV: -124€	PIV: -212€	PICC: -37€	PICC: -21€

Mini-Midline is cheaper! (Per patient & per period)

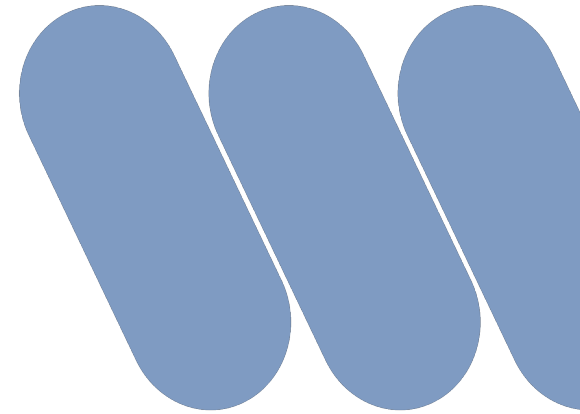
7 days	14 days		21 days
PIV: -152€	PIV: -285€	PICC: -110€	PICC: -109€



CONCLUSION AND DISCUSSION

- Medico economic approach cannot and must not decide the choice of a medical device. However, in a strained economic context, this approach is important and can help the physician's choice
- **Despite a price 93 times higher than PIV, Midline is greatly cheaper than PIV for a 7 and 14 days treatments. It can be explained by the rates and costs of complications, including the induced time-consuming of nurses and operators.**
- **Costs of Midlines and Picc-Lines for 14 and 21 days treatments are similar, lightly in favor on midline in this model.**
- This model can be discussed, and results can differ between other hospitals. Prices of consumables, type of operators and methods of tip placement, rate of complications could influence results

This study demonstrates the cost-effectiveness of using midlines rather than PIV or PICC for patient requiring a peripheral IV therapy for 7, 14 or 21 days.



THANK YOU