

MEDICO-ECONOMIC APPROACH FOR CATHETERS MIDLINE

COMPARATIVE STUDY :
MIDLINES VERSUS
PIV VERSUS
PICC LINES

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LINKS OF INTEREST



Dr ROSAY

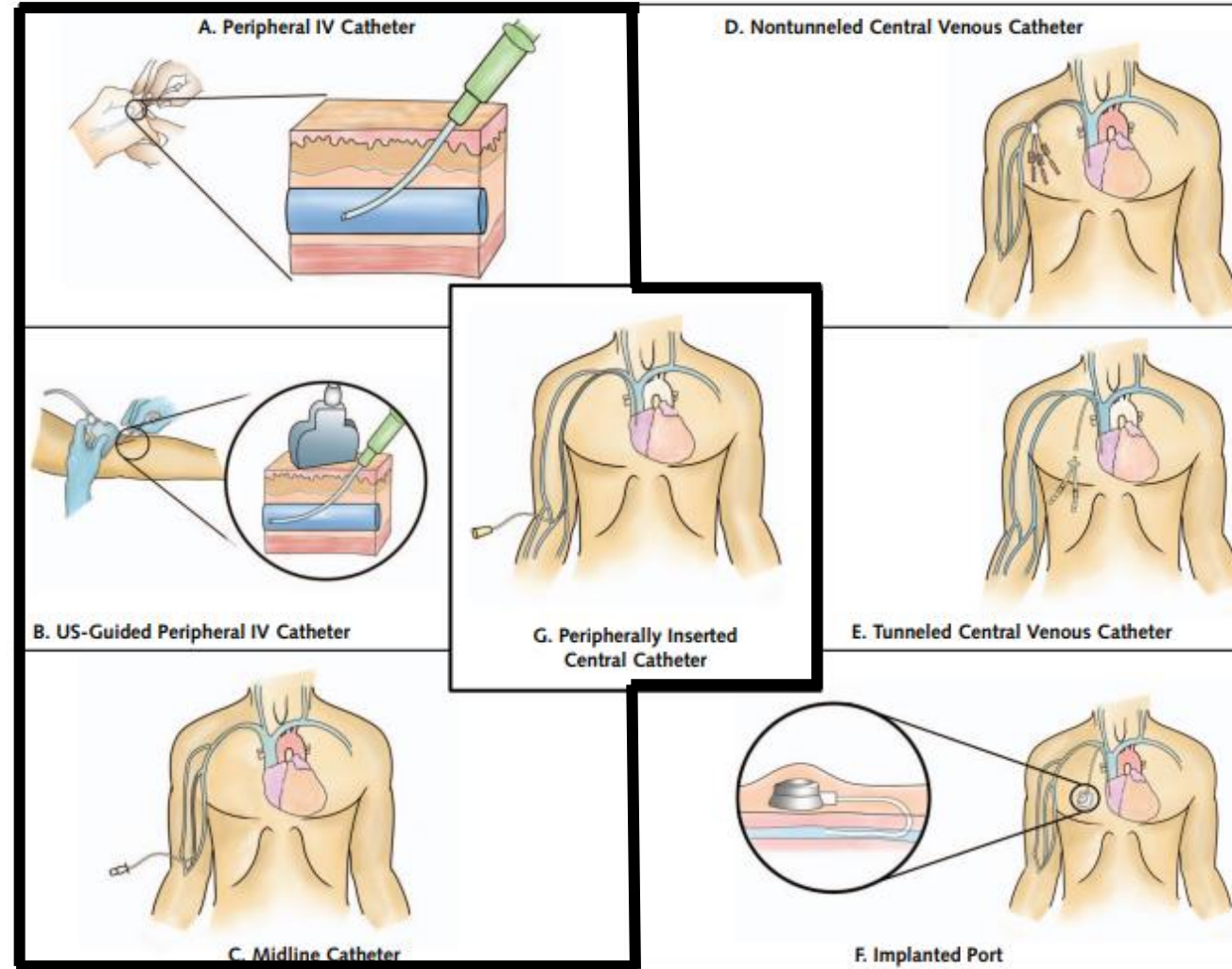
- BD
- VYGON



Mme METO

- CNAM
- VYGON

DIFFERENT DEVICES: PERIPHERAL INFUSATE COMPATIBLE



PERIPHERAL INFUSATE COMPATIBLE

CHOOSE THE BEST CATHETER IS DIFFICULT

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



GAVECELT

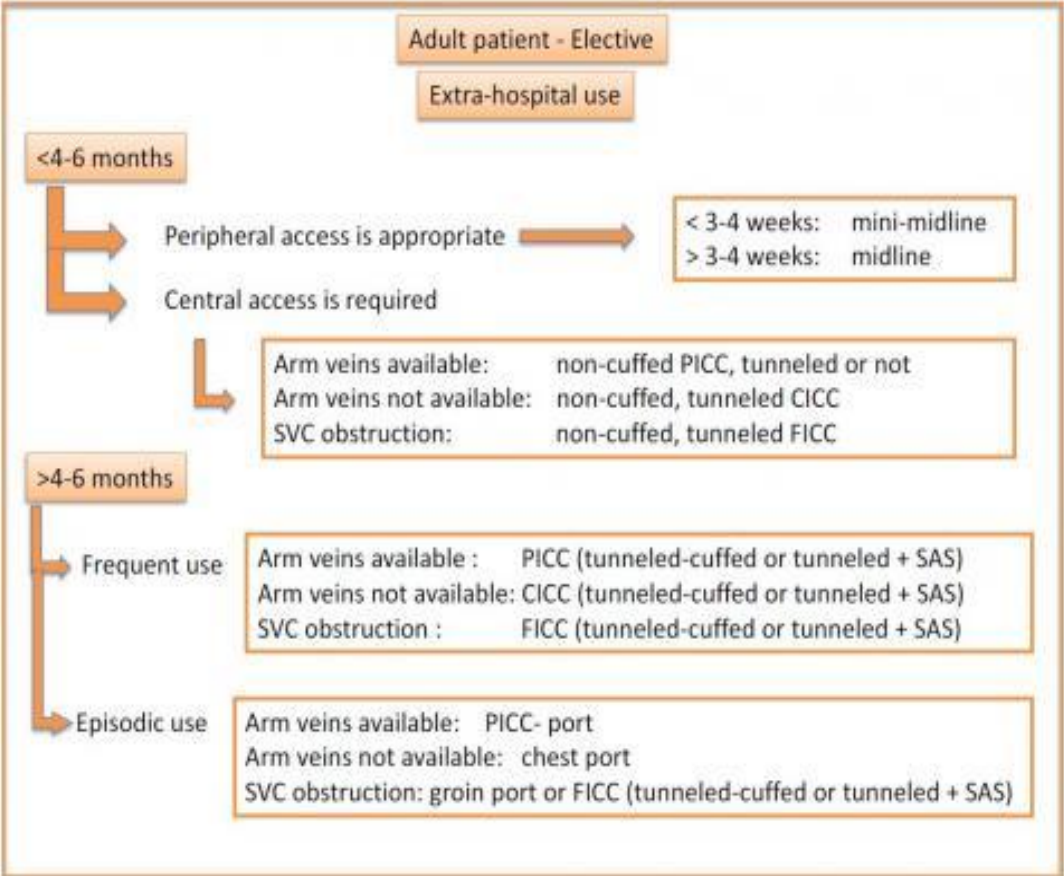
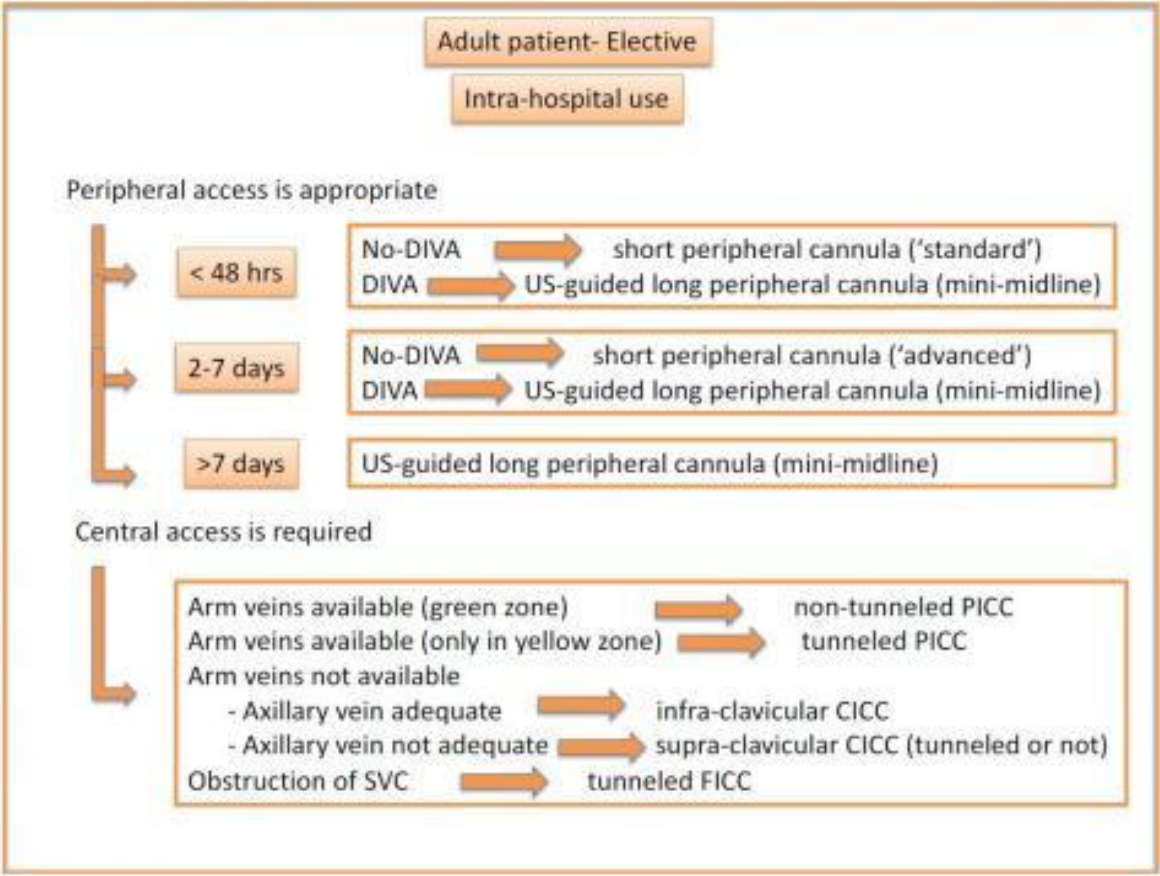




Figure 3. Venous access device recommendations for infusion of peripherally compatible infusate.

| 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

PROTOCOLE 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 Saint, MD, MPH; Scott C. Woller, MD; Naomi P. O'Grady, MD; Nasia Saffar, MD, PhD; Scott O. Trerotola, MD; Rajiv Saran, MD, PhD; Nancy Moureau, BSN, RN; Stephen Wiseman, PharmD; Mauro Pittiruti, MD; Elie A. Akl, MD, MPH, PhD; Agnes Y. Lee, MD, MSc; Anthony Courney, MD; Lakshmi Swaminathan, MD; Jack LeDonne, MD; Carol Becker, MHA; Sarah L. Krein, PhD, RN; and Steven J. Bernstein, MD, MPH



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, Lillian A. Burns, M.T., M.P.H., C.I.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)**



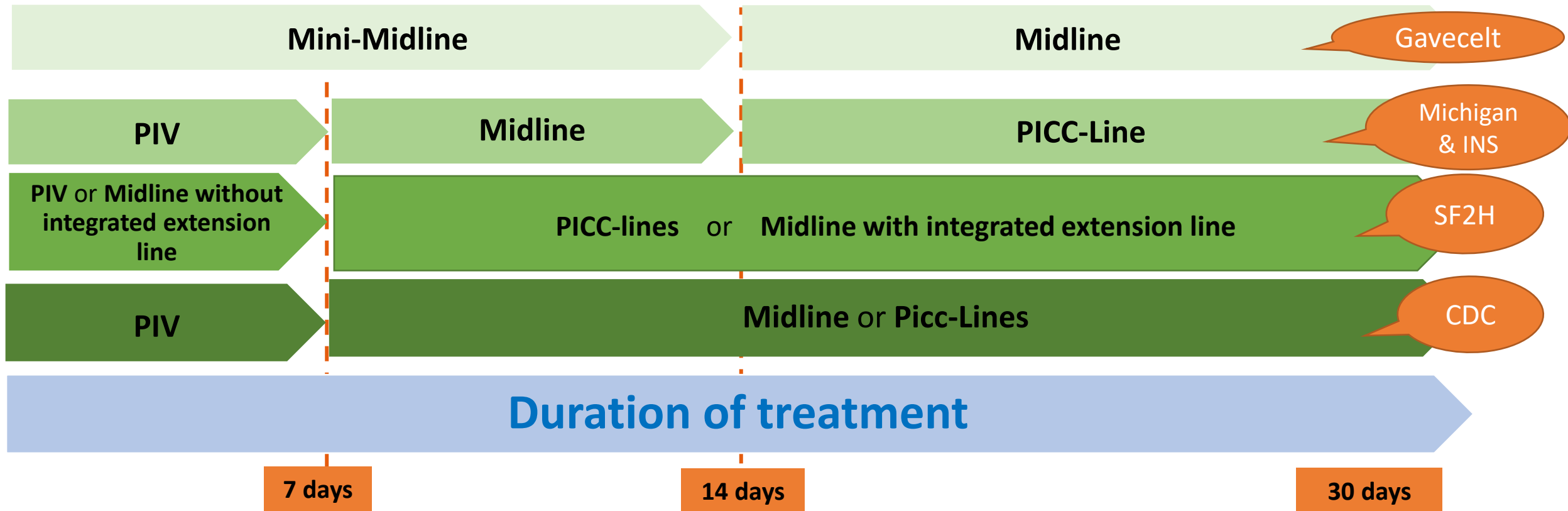
SF2H 2019

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 ? | | Midline avec prolongateur intégré ou PICC | PICC | PICC | PICC | PICC ou CVC tunnellisé avec ou sans manchon | PICC ou CVC tunnellisé ou Chambre à cathéter implantable | CVC | CVC tunnellisé avec ou sans manchon |
| | Bon | Mauvais ¹ | | | | | | | | |
| | CVP | CVP inséré sous échoguidage | | | | | | | | |
| Alternative | Midline sans prolongateur intégré | | CVC en USI | Midline avec prolongateur intégré | CVC tunnellisé ou chambre à cathéter Implantable | CVC en USI | | | | |
| | | | | | | | | | | |



OVERVIEW OF GUIDELINES











IS MEDICO-ECONOMIC APPROACH ABLE TO HELP THE PHYSICIAN TO CHOOSE THE GOOD 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 | |
|  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | | Peritonitis  |
|  | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Cystic fibrosis  |
|  | | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | Meningitis  |

Cost of device, cost of placement.

Cost of complications:

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



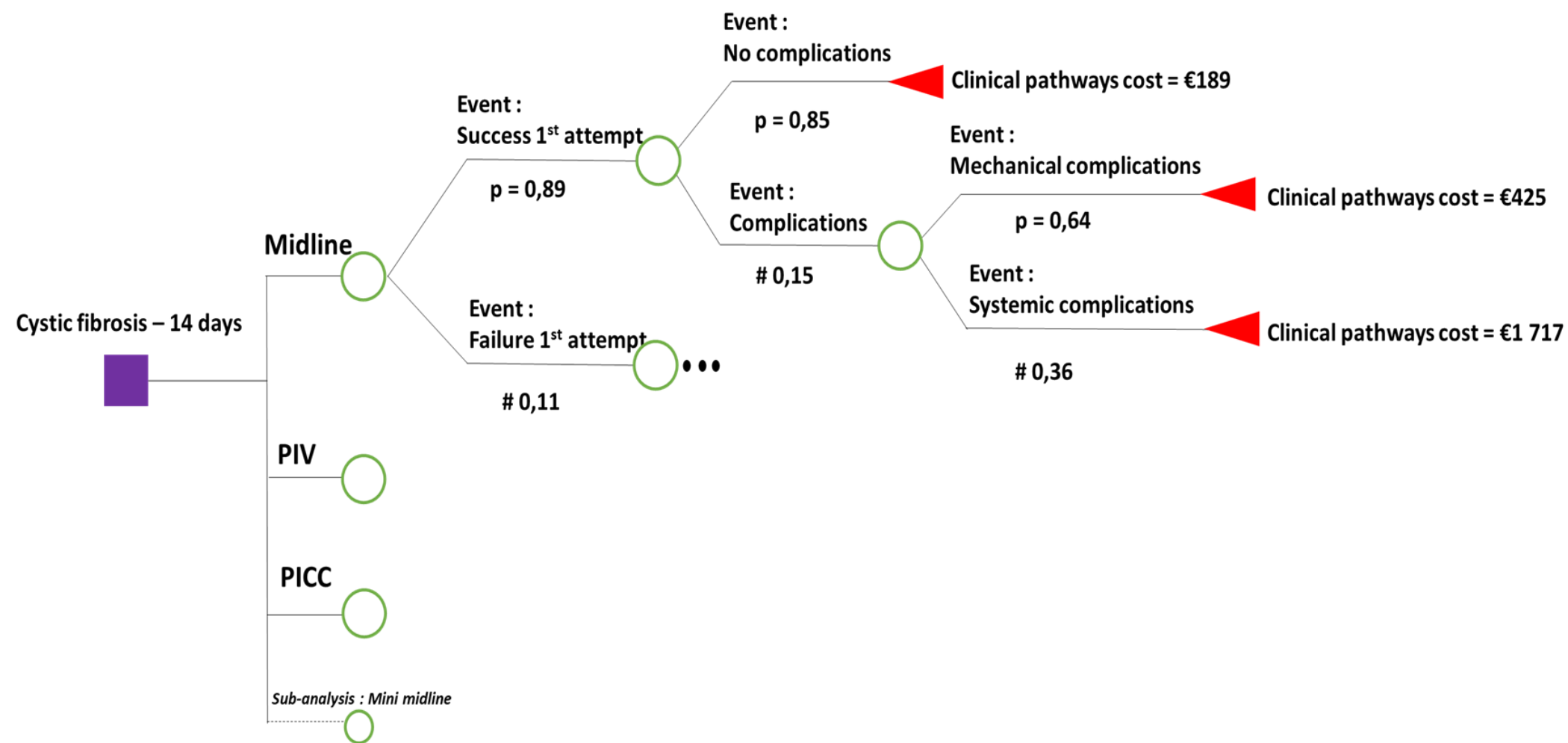
METHODS

STRUCTURE OF THE STUDY

| | | | |
|----------------------------|------------------------------------|------------------------|-------------------|
| 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

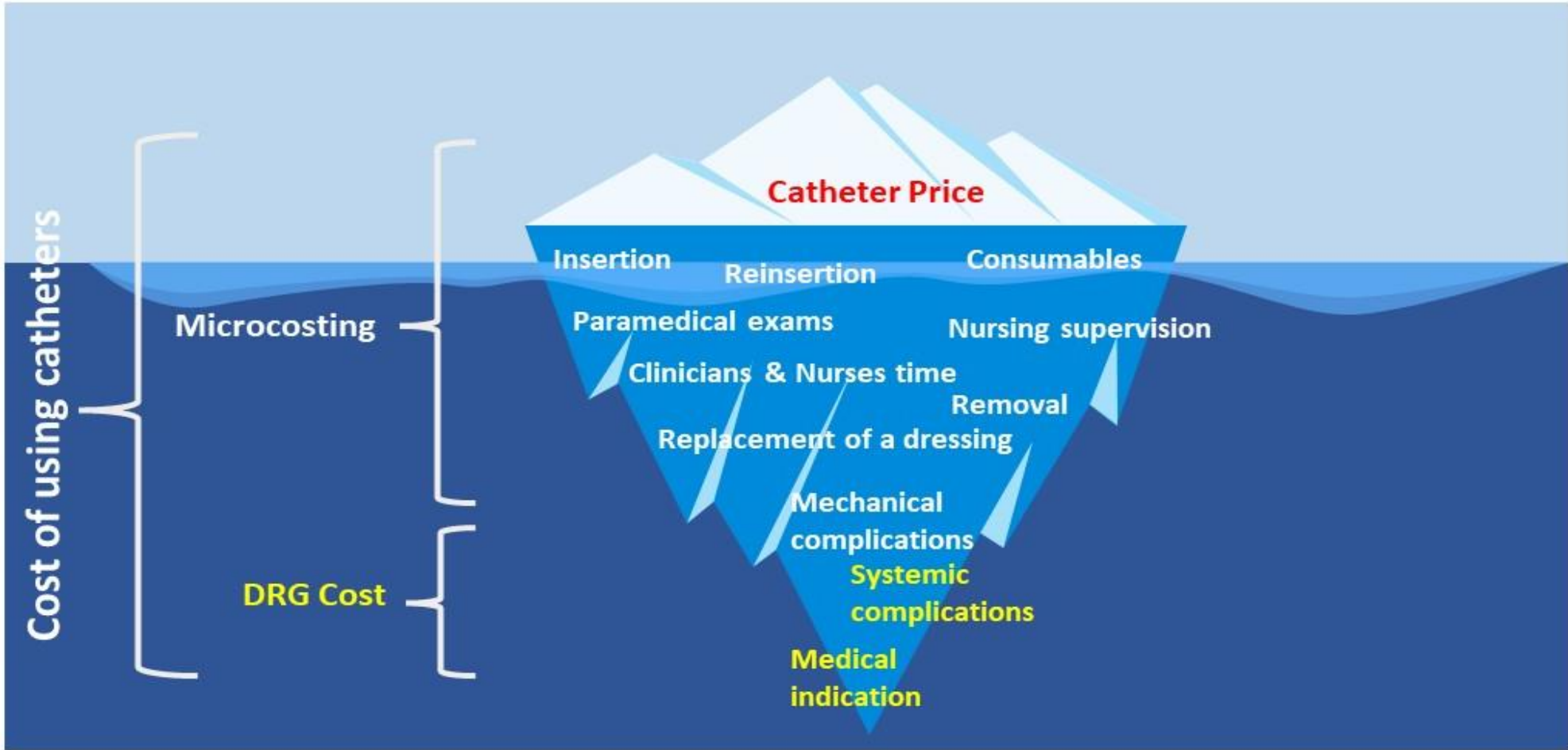


MODEL INPUT PARAMETERS - OCCURRENCE OF COMPLICATIONS (FREQUENCIES FROM A LITERATURE REVIEW)

| <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





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 | | | | | |
| <i>Consumables</i> | €45,66 | €8,39 | €45,71 | €37,27 | - €0,05 |
| <i>Device</i> | €41,67 | €3,02 | €66,28 | €38,65 | - €24,61 |
| <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> | €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 | | | | | |
| <i>Ex : medical indication</i> | €10 775,16 | €10 775,16 | €10 775,16 | €0,00 | €0,00 |
| <i>Cystic fibrosis</i> | | | | | |
| <i>Systemic complications</i> | €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 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



THANK YOU

ANY QUESTION?