

DOES AUTOMATING WATER FLUSHES IMPACT THE CARE COSTS OF ENTERAL NUTRITION THERAPY?

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Introduction:

- Enteral nutrition (EN) is required by many critically ill patients
- While nutrition formula provision is generally automated, water flushing is mostly manual
- Hospital staff follow rigid and time consuming manual flushing schedules to help prevent:
 - Feeding tube clogging (TC)
 - Patient dehydration
- Feed and flush technology (FFT) (Figure 1) automates both feeding and water flushing. It may help to reduce TC, dehydration, and hospital staff time
- While studies of FFT support a reduction in TC¹, dehydration² and hospital staff workload³, the economic impact remains largely unaddressed
- This study **AIMS** to fill this information gap by investigating the expected costs of a full transition to FFT in the French, German, Italian and US settings through dedicated budget impact models

Figure 1
Feed and flush pump & feeding bags



Methods:

- A structured literature review of EMBASE and PubMed was performed to identify relevant cost and outcome data for EN
- A cohort Markov model was developed (following good practice guidelines⁴), which started in critical care as either malnourished or healthy (Figure 2)
- Major efficacy endpoints:
 - Malnutrition
 - Dehydration
- Care quality endpoints:
 - Length of stay
 - Days on enteral nutrition
 - Readmissions to hospital
 - Acute kidney injury (AKI)
- The major safety endpoint was tube clogging. As it implies higher risk of dehydration or malnutrition and entails a cost of either removing the obstruction or replacing the tube
- In the model every 3 days 100 patients were assessed over a duration of 1 year
- The model was adapted to different settings by using local incidence and cost data (Table 1)
- Probabilistic sensitivity analysis (PSA) was utilized to determine the significance (95% level) of results over 500 evaluations

Table 1 Key local costs

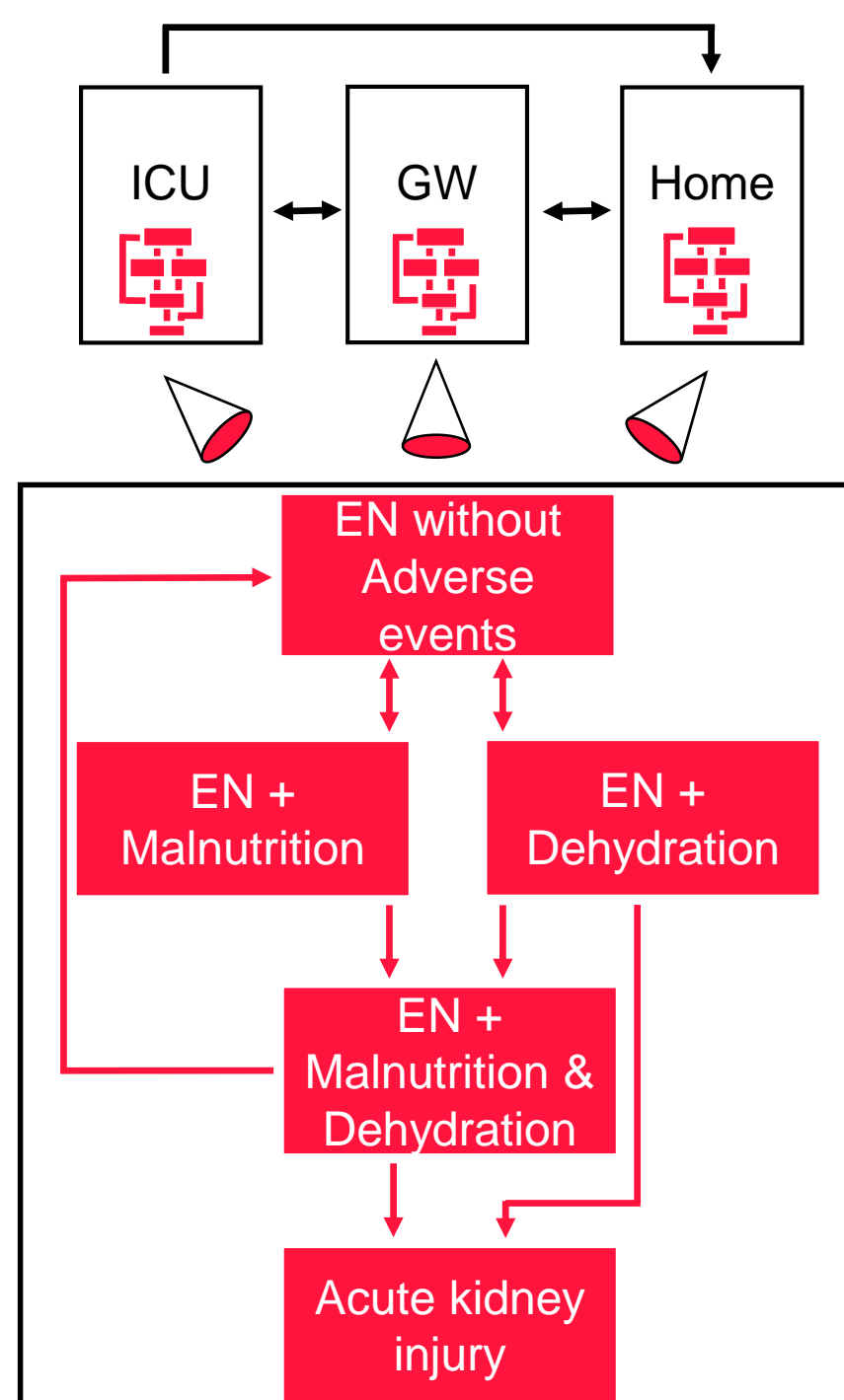
	FR	GER	IT	US
Day on ICU	€ 1,415 ⁵	€ 1,004 ¹¹	€ 1,766 ¹²	\$ 2,002 ¹⁵
Day on GW	€ 713 ⁶	€ 731 ¹¹	€ 250 ¹³	\$ 1,878 ¹⁶
Day of HEN	€ 107	€ 26 ⁶	€ 11 ¹³	\$ 11 ¹⁷
Nurse fee	€ 22 ⁸	€ 34 ²	€ 16 ¹⁴	\$ 42 ⁹
Tube clogging	€ 48 ⁹	€ 41 ⁹	€ 36 ⁹	\$ 91 ⁹
Readmission	€ 1,541 ¹⁰	€ 1,403 ¹⁰	€ 1,211 ¹⁰	\$ 15,000 ¹⁷

ICU: Intensive care unit, GW: General ward, HEN: Home enteral nutrition

References

1. Nadeau, B. et al. (2017)
2. Cavalheiro A. et al. FELANPE (2016)
3. Sullivan, S. D. et al. Value in Health (2014)
4. Nadeau W et al. ESPEN (MON P234) (2017)
5. Garrigues B et al. Value in Health (2011)
6. Aubry P. et al. BMC Nephrology (2016)

Figure 2 Markov model flow



Results:

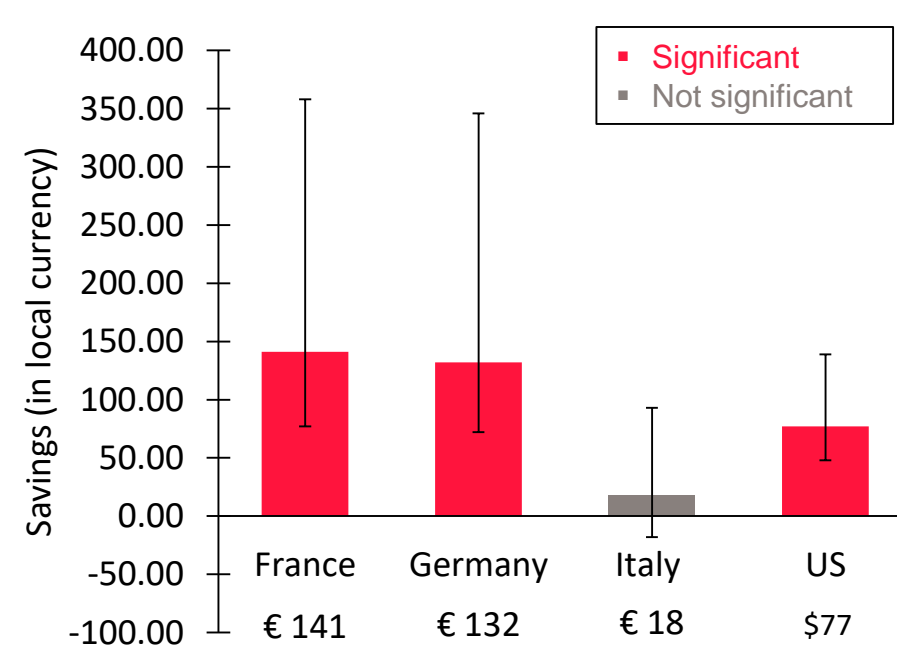
- The structured literature review revealed a plethora of data on malnutrition
- Dehydration data, on the other hand, were scarce
- Utilizing the data identified, the model revealed that a transition to FFT for EN would potentially be cost saving in France, Germany, Italy and the US (Table 2)

Table 2 Annual costs per patient

	France	Germany	Italy	United States
Feed only	€ 13,090	€ 13,790	€ 13,448	\$ 24,242
Feed and flush	€ 12,982	€ 13,683	€ 13,436	\$ 24,162
Average Savings	€ 108	€ 107	€ 12	\$ 80

- Despite considerable differences in individual costs (Table 1), the overall annual cost of care is similar across investigated European countries (Table 2)
- The PSA showed significant savings for France, Germany and the US (Figure 3)
- Further clinical outcome analysis found significant (p<0.05) reductions for TC and readmissions (Figure 4) for FFT usage in all settings

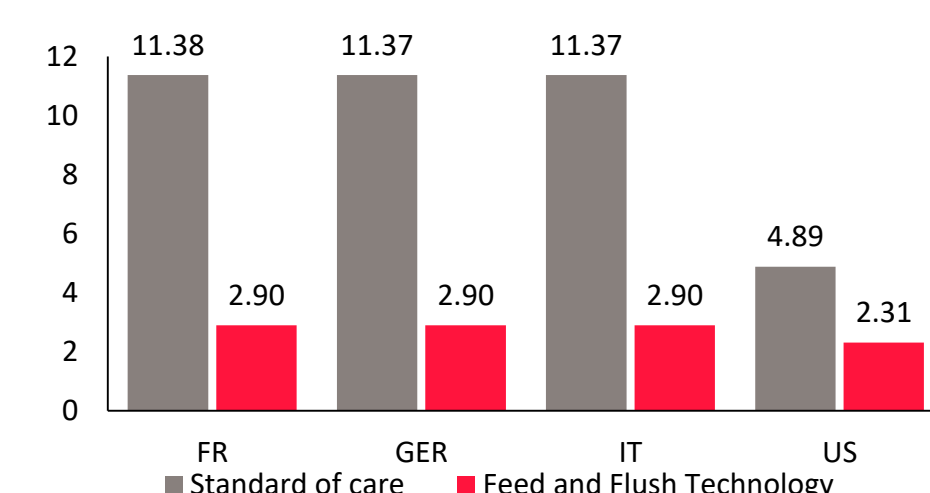
Figure 3 Median annual savings per patient



Error bars indicate 95% credible interval

- In contrast, AKI and death rates were not significantly impacted
- The nurse workload per patient was reduced by an average of 250 minutes, with a range of 200 to 312 minutes over 1 year

Figure 4 Readmissions per 100 patient-years on HEN



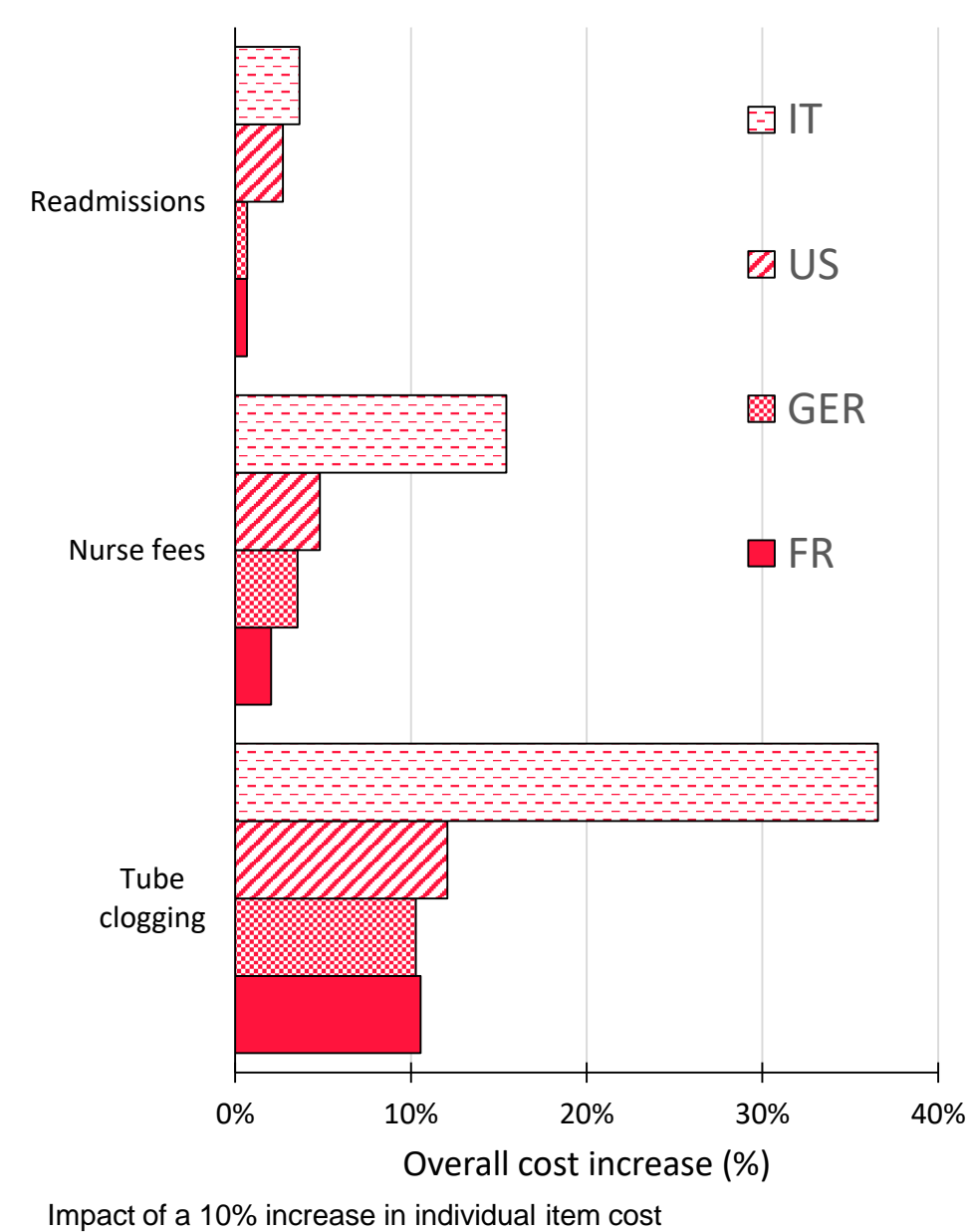
HEN: Home enteral feeding

- Readmissions, nurse salary and tube clogging were identified as major cost drivers by artificially changing their costs in the model and observing consequences for the overall costs (Figure 5)

Conclusions:

- Feed and flush technology likely has advantages for patient safety and resource usage
- Cost savings were found in all settings, with significant advantages for France, Germany and the US
- Patient benefits of reduced tube clogging and readmission rates, as well as reduced burden on hospital staff, likely makes the transition to feed and flush technology desirable
- To estimate the full potential of automated water flushing more data on dehydration and its consequences is required

Figure 5 Cost drivers



Disclosure of Interest:

R. Torrejon Torres Consultant for: Cardinal Health and other medical device manufacturers, Other: Employee of Coreva Scientific, W. Nadeau Other: Employee of Cardinal Health, the sponsor of the study, R. Saunders Consultant for: Cardinal Health and other medical device manufacturers, Other: Owner of Coreva Scientific, which received consultation fees from Cardinal Health