

A Simulation of Strategies to Launch a Home Therapies Program in a Conventional Hemodialysis Facility

Eric D. Weinhandl,^{1,2} Stephan C. Dunning,³ Tonya Saffer,³ Michael A. Aragon³

¹Satellite Healthcare, San Jose, California, ²University of Minnesota, Minneapolis, Minnesota, ³Outset Medical, San Jose, California

BACKGROUND

- Approximately 47% of Medicare-certified dialysis facilities in the United States do not offer home dialysis, and another 8% of facilities are credentialed to offer home dialysis, but have no active patients (2021 USRDS Annual Data Report).
- In these facilities, conventional hemodialysis (CHD) may be perceived by patients as the only dialytic therapy that exists, thus serving as a constraint on home dialysis expansion.
- Launching a home therapies program from this base leads to questions about patient selection, modality mix, device utilization, and financial impact.
- We designed a Markov chain Monte Carlo simulation to forecast and compare 5-year clinical and economic outcomes in a conventional hemodialysis (CHD) facility that pursues various strategies for growing home dialysis, including use of either an incumbent or innovative home hemodialysis (HHD) device.
- As a secondary analysis, we applied the simulation model to forecast and compare 5-year clinical and economic outcomes in a *de novo* home therapies program (*i.e.* a home-only dialysis program).

METHODS

- We simulated modality mix and total revenue in a facility with 100 CHD patients in December 2022 and an average of two incident dialysis patients per month during 2023-2027.
- We modulated three parameters:
 - (1) The rate of conversion from CHD to home hemodialysis (HHD)
 - (2) Peritoneal dialysis (PD) and HHD adoption among incident dialysis patients
 - (3) HHD device utilization, with use of an innovative HHD device that reduces HHD training attrition and the rate of conversion from HHD to CHD by 40%
- For economic analyses, we set the Medicare Part B rate for hemodialysis at \$257, and presumed inflation factors of 1.15 and 2.20 for Medicare Advantage and commercial insurance, respectively.
- We ran each scenario for 500 iterations, and estimated means of parameters.
- In the secondary analysis, we simulated modality mix and total revenue in a new facility with a base of 12 home dialysis patients in December 2022 and an average of two incident dialysis patients per month during 2023-2027.

RESULTS

- Under current conditions—15% of incident patients on home therapies and only 2 conversions from CHD to HHD per 100 patients per month—the launch of a home therapies program results in home dialysis utilization of 12.1% (incumbent device) vs. 12.8% (innovative) by 2027.
- Focusing only on increasing home dialysis adoption among incident patients increases home dialysis utilization to 23.1% (incumbent device) vs. 25.6% (innovative), whereas maintaining that focus and increasing conversion from CHD to HHD increases home dialysis utilization to 36.8% (incumbent device) vs. 40.5% (innovative) by 2027 (Table 2).
- Reducing HHD attrition with an innovative device, both in training and at home, increases HHD utilization by 1.5% to 3.5% in most scenarios, relative to use of an incumbent HHD device.
- Increasing home dialysis utilization results in similar or higher treatment revenue per year, as compared with current conditions (Table 3).
- Due to lower risk of HHD attrition, use of an innovative device results in 9.7% to 15.5% higher cumulative revenue per HHD patient initiation (Table 4).

Table 1. Monthly probabilities of transitions between modalities/states

Current state	PD	HHD	CHD	Death or Transplant
Incident ESKD	14.5% / 20% / 20%	0.5% / 5% / 20%	85% / 75% / 60%	
PD	97.5%		1%	1.5%
HHD (in training)		83.6%	15%	1.4%
HHD (at home)		97.6%	1%	1.4%
CHD		0.2% / 0.6% / 1%	98.3% / 97.9% / 97.5%	1.5%

Table 2. Home dialysis utilization in 2027, following launch of a home therapies program in a CHD facility with 100 patients in December 2022

Monthly % of CHD to HHD	HHD device	Incident modality mix: 14.5% PD, 0.5% HHD		Incident modality mix: 20% PD, 5% HHD		Incident modality mix: 20% PD, 20% HHD	
		PD	HHD	PD	HHD	PD	HHD
0.2%	Incumbent	7.5%	4.6%	10.2%	6.7%	10.2%	12.9%
	Innovative	7.5%	5.3%	10.2%	7.5%	10.5%	15.1%
0.6%	Incumbent	7.4%	12.8%	10.2%	14.2%	10.0%	20.5%
	Innovative	7.3%	14.5%	10.3%	16.4%	10.1%	23.3%
1.0%	Incumbent	7.3%	20.0%	10.2%	20.9%	10.1%	26.7%
	Innovative	7.5%	22.5%	10.1%	23.9%	10.3%	30.2%

Table 3. Mean treatment revenue (millions) in 2023 and 2027, following launch of a home therapies program in a CHD facility with 100 patients in December 2022

Monthly % of CHD to HHD	HHD device	Incident modality mix: 14.5% PD, 0.5% HHD		Incident modality mix: 20% PD, 5% HHD		Incident modality mix: 20% PD, 20% HHD	
		2023	2027	2023	2027	2023	2027
		0.2%	Incumbent	4.49	5.34	4.52	5.35
	Innovative	4.48	5.38	4.49	5.42	4.56	5.57
0.6%	Incumbent	4.50	5.45	4.54	5.53	4.58	5.67
	Innovative	4.48	5.52	4.53	5.68	4.50	5.78
1.0%	Incumbent	4.58	5.59	4.59	5.78	4.58	5.77
	Innovative	4.56	5.73	4.56	5.78	4.61	5.85

Table 4. Mean cumulative revenue per HHD patient initiation, in the setting of incident modality mix of 25% on home therapies, with 20% PD and 5% HHD

HHD device	Monthly % of CHD to HHD: 0.2%	Monthly % of CHD to HHD: 0.6%	Monthly % of CHD to HHD: 1.0%	De novo Home-only Program
Incumbent	\$86,672	\$86,381	\$91,114	\$87,055
Innovative	\$95,058	\$99,771	\$101,789	\$98,900
Increase	9.7%	15.5%	11.7%	13.6%

DISCUSSION

- In an existing dialysis facility without a home therapies program,
 - meaningful growth of home dialysis is achieved by sustained focus on both incident and prevalent dialysis patients.
- Conversion of patients from in-center to home hemodialysis confers a stronger effect on overall home dialysis utilization than incident modality alone.
- The increase in cumulative treatment revenue per HHD initiation means fewer HHD starts needed to achieve equal revenue in the program and reduced staff burden to identify and train new HHD patients.
- This simulation is limited to the impact of modality mix on treatment revenue. Additional cost savings from reduced home dialysis training nurse hours, and reduction in CHD staffing was not modeled.

CONCLUSION

Utilization of innovative HHD devices, that improve retention at home, such as the Tablo[®] Hemodialysis System, can accelerate home dialysis growth and positively impact facility revenue.