



Corporate Presentation

(NASDAQ: CHFS)

October 2018



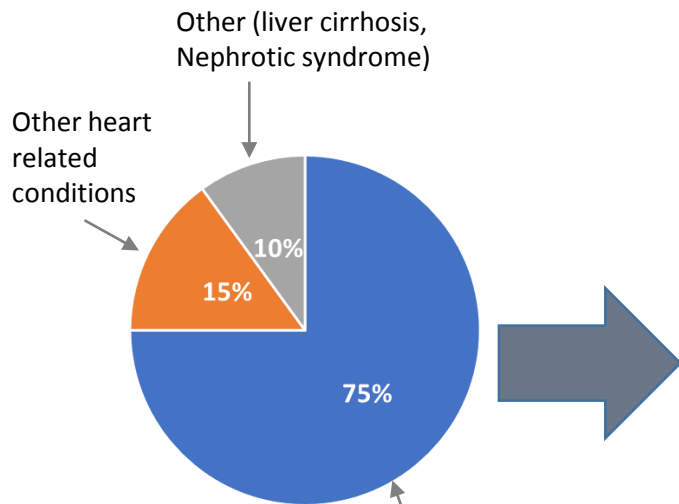
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This presentation contains forward-looking statements. All forward-looking statements are management's present expectations of future events and are subject to a number of risks and uncertainties. Various factors could cause actual results to differ materially from these statements including our ability to execute on our commercial strategy and to grow our Aquadex business, our post-market clinical data collection activities, benefits of our products to patients, our expectations with respect to product development and commercialization efforts, our ability to increase market and physician acceptance of our products, potentially competitive product offerings, intellectual property protection, our expectations regarding anticipated synergies with and benefits of the Aquadex business, and the other risks set forth under the caption "Risk Factors" and elsewhere in our periodic and other reports filed with the U.S. Securities and Exchange Commission ("SEC"), including our Annual Report on Form 10-K for the fiscal year ended December 31, 2017. We are providing this information as of the date of this presentation and do not undertake to update any forward-looking statements contained in this presentation as a result of new information, future events or otherwise. Although the Company believes that the forward-looking statements are reasonable and based on information currently available, it can give no assurances that the Company's expectations are correct. All forward looking statements are expressly qualified in their entirety by this cautionary statement.

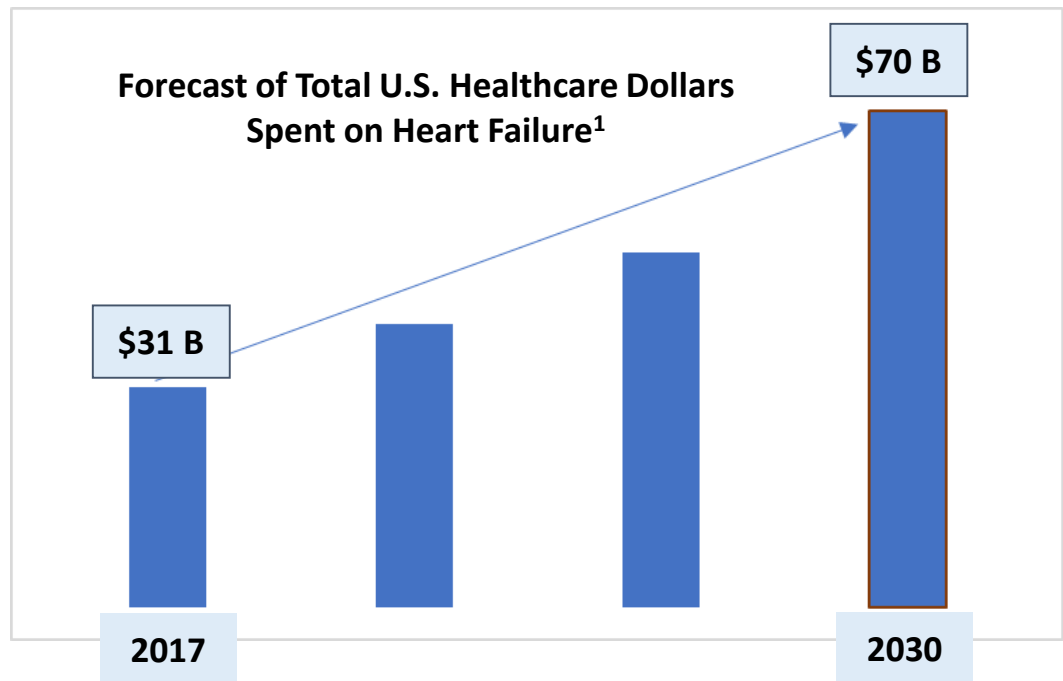
This presentation also contains estimates and other statistical data made by independent parties and by us relating to market shares and other data about our industry. These data involves a number of assumptions and limitations, and you are cautioned not to give undue weight to such estimates.

Aquadex Flex Flow is a registered trademark of CHF Solutions, Inc.

Fluid Management Market Size is Large and Growing



Congestive Heart Failure (CHF) represents approx. 75% of total U.S. Fluid Management market²



Fluid Overload in Heart Failure is a significant burden on the U.S. Healthcare System

Congestive Heart Failure (CHF) is the leading cause of fluid overload– and is the Company's primary disease target

¹ Circ Heart Fail. 2013 May

² McKinsey study internal document 2012

Fluid Overload in Heart Failure Patients is Overwhelming

6.5M

- U.S. patients with HF and expected to rise to 8M patients by 2030^{1,2}
- HF is the largest driver of Medicare costs

>1 M

- Annual U.S. and EU heart failure hospitalizations³
- Congestion (fluid overload) is primary cause³

90%

- Heart failure hospitalizations are due to fluid overload³

¹ Benjamin EJ. et al, 2017 Update: A Report from the American Heart Association. Circulation. 2017; 135(10):e146-e603

² SavareseG, LundL, Card Fail Rev. 2017; 3(1): 7-11

³ Costanzo MR, et al. J Am Coll Cardiol. 2017;69(19):2428-2445.

Diuretics are the Standard of Care, but Fail to Provide Optimal Outcomes in Many Patients

- 40% of patients demonstrate **diuretic resistance** ("failure") and 68% show **sub-optimal response**¹
- 68% of HF patients are discharged from the hospital with residual excess fluid²
 - Worsening heart failure with **increased mortality** after discharge
 - Insufficient symptom relief, such as **persistent congestion**
 - Increase in **re-hospitalization** rates
 - Risk of **electrolyte imbalance** (i.e. low magnesium and low potassium)



¹ Testani, Circ Heart Failure, 2016;9:e002370

² Costanzo MR, et al., J Am Coll Cardiol., 2017; 69: 2428-45

90% of all 30-Day Readmissions Due to Heart Failure

In 2012 the Affordable Care Act instituted the Hospital Readmission Reduction Program¹

- **Requirement:** CMS to reduce payments to hospitals with excess readmissions
- **Penalty:** hospitals can lose $\leq 3\%$ of Medicare reimbursement on all admissions
- **2017 Update** from Journal American Medical Association (JAMA):²
 - **Decrease in heart failure related readmissions but increase in 30-day and 1 year mortality rates**

¹ Readmissions Reduction Program (HRRP). Centers for Medicare & Medicaid Services website. Updated April 18, 2016. Accessed May 25, 2016.

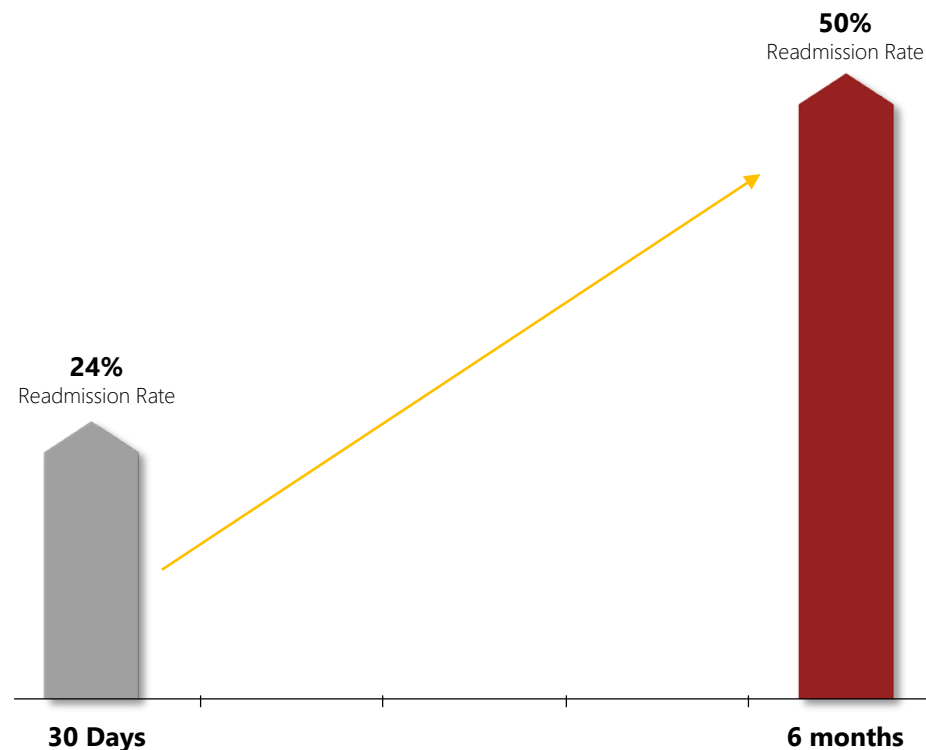
² Journal of the American Medical Association (JAMA), November 2017



Fluid Overload in HF Patients is a Recurrent Problem

Recurrent fluid overload in heart failure is associated with worse outcomes independent of age and renal function

- 24% of patients are readmitted within 30 days of hospital release¹
- 50% of patients are readmitted within 6 months of hospital discharge¹
- Adds to the economic cost burden



¹ Costanzo MR, et al. J Am Coll Cardiol. 2017 May 16;69(19):2428-2445

Aquadex® FlexFlow System

A Solution to this Unmet Clinical Need

- 40% more fluid removal than conventional diuretic drug therapy over the same period of time¹
- No clinically significant impact on electrolytes balance, blood pressure, or heart rate^{1,2}
- 53% reduction in the risk of rehospitalization than those treated solely with diuretics at 90 days³
- Fewer re-hospitalization days due to cardiovascular event⁴

1 Bart BA, et. al., *Am Coll Cardiol.*, 2005;46:2043–6

2 Jaski BE et al. *J Card Fail.* 2003; 9(3):227-231

3 Costanzo MR, et al. *J Am Coll Cardiol.* 2007 Feb 13; 49(6): 675-683.

4 Costanzo MR, et. al., *J Am Coll Cardiol.*, 2005;46:2047–51.



The Value and Utility Advantages of Aquadex FlexFlow are Compelling

- **Safe, effective**, and **clinically proven** to remove excess salt and water from the body
- Rapid and predictable rate of fluid removal
- Efficient patient to nurse workflow
- Prescribed by any medical specialty
- Customizable therapy plan based on provider's clinical goals for their patient



Compelling Clinical Results Demonstrate the Potential of Aquadex FlexFlow

Good Samaritan Hospital- A Single Center Experience

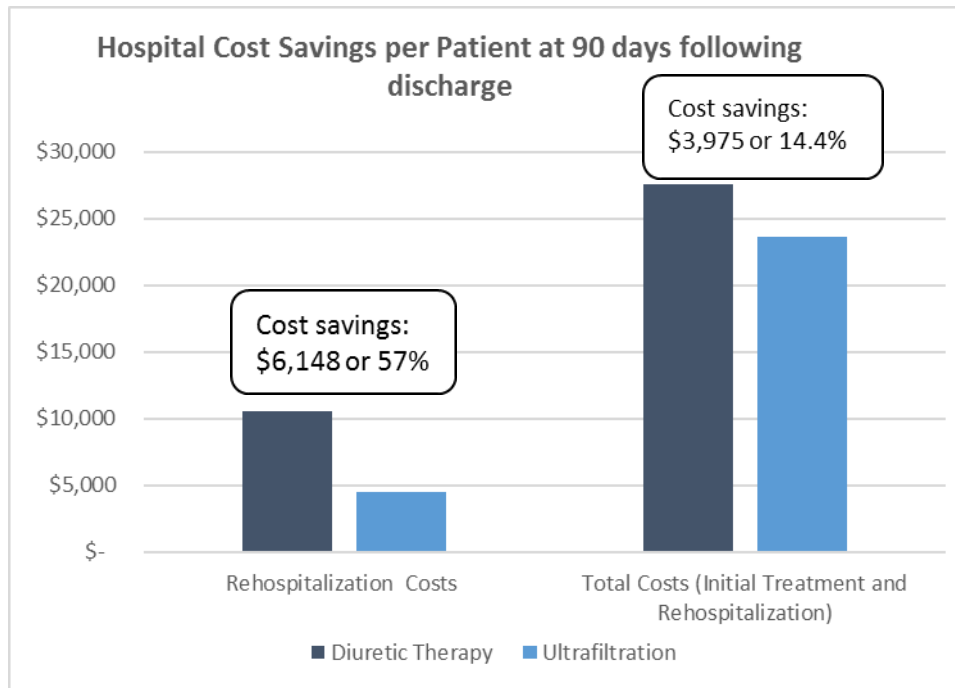
Independent study of 67 heart failure patients who received aquapheresis:

- No 30-day readmits for volume overload
- Length of stay when started within 24 hours was 2.2 days, compared to national average of 5.9 days
- Readmission rate from before aquapheresis down from 12% to 4% the year prior
- Average of 5.7 liters removed per patient

*Data presented at the National Teaching Institute & Critical Care Exposition (NTI) in Chicago, IL on May 5-8, 2008. Results may vary.



New Data Shows Ultrafiltration Therapy Demonstrates a Cost Savings at 90 Days



Cost savings from reduced hospital readmission days were **\$3,975 (14.4%)** at 90-days:

- IV diuretics costs: \$27,608
- Ultrafiltration costs: \$23,633

Despite higher up-front costs, ultrafiltration reduces hospital readmission rates and duration, which substantially lowers costs over a 90-day period compared to IV diuretics.

Costanzo MR, et al. Ultrafiltration vs. Diuretics for the Treatment of Fluid Overload in Patients with Heart Failure: A Hospital Cost Analysis. Poster presented at the ISPOR International Meeting, May 19-23, 2018, Baltimore, MD, USA

Clinical Guidelines Support Use of Ultrafiltration



ACC/AHA – American College of Cardiology/ American Heart Association¹

Ultrafiltration may be considered for patients with obvious volume overload to alleviate congestive symptoms and fluid weight, or with refractory congestion not responding to medical therapy

HFSA - Heart Failure Society Of America²

Ultrafiltration may be considered in lieu of diuretics

ESC / HFA - European Society of Cardiology and Heart Failure Association³

Venovenous isolated ultrafiltration is sometimes used to remove fluid in patients with HF, although is usually reserved for those unresponsive or resistant to diuretics

CCS - Canadian Cardiovascular Society⁴

Patients with persistent congestion despite diuretic therapy, with or without impaired renal function, may, under experienced supervision, receive continuous venovenous ultrafiltration

1 Yancy CW, et al. *J Am Coll Cardiol*. 2013 Oct 15; 62(16): e147-e239.

2 HFSA 2010 Comprehensive Heart Failure Practice Guidelines: Lindenfeld J, et al. *J Card Fail*. 2010 Jun; 16(6): 475 – 539.

3 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012: McMurray JJ, et al. *Eur Heart J*. 2012 Jul; 33(14): 1787 – 1847.

4 2012 Canadian Cardiovascular Society Heart Failure Management Guidelines Update: McKelvie RS, et al. *Can J Cardiol*. 2013 Feb; 29(2): 168 – 181.

New Market Opportunity – CV Surgery

- 7.3M cardiovascular operations and procedures per year in the US¹
 - 500,000+ Coronary Artery Bypass Grafts (CABG) per year in US²
 - 80,000 Valve procedures per year in US³
- 5-6 liters of fluid added to maintain cardiac output and blood pressure to accommodate anesthesia and bypass machine⁴
- CV surgery is being safely performed on patients 80+ years due to advances in cardiopulmonary bypass techniques

1 National Center for Health Statistics 2009

2 Coronary Artery Bypass Graft (CABG) Market Analysis By Type (Saphenous Vein Grafts, Internal Thoracic Artery Grafts), By Surgical Procedures, By Technology (On-Pump CABG, Off-Pump CABG), And Segment Forecasts, 2018 – 2025, Grand View Research

3 iData Research: <https://idataresearch.com/over-182000-heart-valve-replacements-per-year-in-the-united-states/>

4 Pradeep A, Rajagopalam S, Kolli AK, et al. HSR Proceedings in Intensive Care and Cardio Anesthesiology 2010; 2: 287-296

CV Surgery Post-Op Complications

- Volume Overload – Due to IV fluids and medication inhibits healing
- Potential acute kidney injury from bypass machine and anesthesia
 - Affects up to 30% of patients¹
 - Fluid overload and rises in serum creatinine associated with longer ICU stays and increased mortality²
- Prolonged intubation
 - Excessive fluid and pulmonary edema causes respiratory issues
 - Associated with increased mortality³

1. O'Neal JB, Shaw AD, Billings FT (2016) Acute kidney injury following cardiac surgery: current understanding and future directions. Crit Care 20(1):187. doi: [10.1186/s13054-016-1352-z](https://doi.org/10.1186/s13054-016-1352-z)

2. Stein A, de Souza LV, Belettini CR, Menegazzo WR, Viégas JR, Costa Pereira EM, et al. Fluid overload and changes in serum creatinine after cardiac surgery: predictors of mortality and longer intensive care stay. A prospective cohort study. Crit Care. 2012;16:R99

3. Federico Pappalardo, Annalisa Franco, Giovanni Landoni, Paola Cardano, Alberto Zangrillo, Ottavio Alfieri; Long-term outcome and quality of life of patients requiring prolonged mechanical ventilation after cardiac surgery, *European Journal of Cardio-Thoracic Surgery*, Volume 25, Issue 4, 1 April 2004, Pages 548–552, <https://doi.org/10.1016/j.ejcts.2003.11.034>

Failure of Diuretic Therapy

Diuretic agents are still the standard of care for post surgical volume overload – the story remains the same

- IV loop diuretic agents are routinely used in the post-operative period to manage fluid
- Diuretic resistance is a concern for providers when treatment goals are not being met in the post-op setting as up to 40% of patients can be resistant¹
- Decreased urine output is common after surgical procedure
- Evidence suggests diuretic use after procedures such as CABG may not provide clinical benefit²

1 Testani JM, Hanberg JS, Cheng S, et al. *Circ Heart Failure*. 2016;9(1)

2 PLim, E., Ali, Z.A., Attaran, R. et al, Evaluating routine diuretics after coronary surgery: a prospective randomized controlled trial. *Ann Thorac Surg*. 2002;73:153–155.

Aquadex FlexFlow Solution

- Allows safe and precise control of fluid removal by setting the rate and amount of fluid removed
- Approximately 35 ml of extracorporeal blood volume in patented blood circuit
- Has shown to have no significant changes to electrolytes¹
- Easy set-up and operation
- Simplified form of ultrafiltration that can be prescribed by any physician trained in extracorporeal therapy

1. De Vecchis R et. Al. Minerva Cardioangiol. 2014; 62:131-146

CV Surgical Procedures

- Aquadex therapy can be used after cardiac procedures to remove fluid overload when diuretics fail
 - Valve repair or replacement
 - CABG (Coronary Artery Bypass Graft)
 - LVAD (Left Ventricular Assist Device) Implant
 - Heart Transplant
- Prescribers can include:
 - CT Surgeons
 - Surgical PA
 - Intensivists
 - Cardiologist



CHF Solutions' Business Overview

- Aquadex therapy is ultrafiltration to reduce fluid overload in patients, when diuretics fail
- Designed to be used by cardiologists early in the heart failure treatment protocol
- Growing opportunity in treating fluid overloaded patients post CV surgery
- Acquired from Baxter in August 2016 and now manufacturing all products in our Eden Prairie, MN facility
- FDA 510(k) market cleared; sold internationally with the CE mark
- Recently expanded US sales team to 13 sales territories and 5 clinical specialists
- Distribution partners in UK, Italy, Germany, Spain, Singapore, Hong Kong and Thailand



Aquadex Product Overview

Aquadex Console



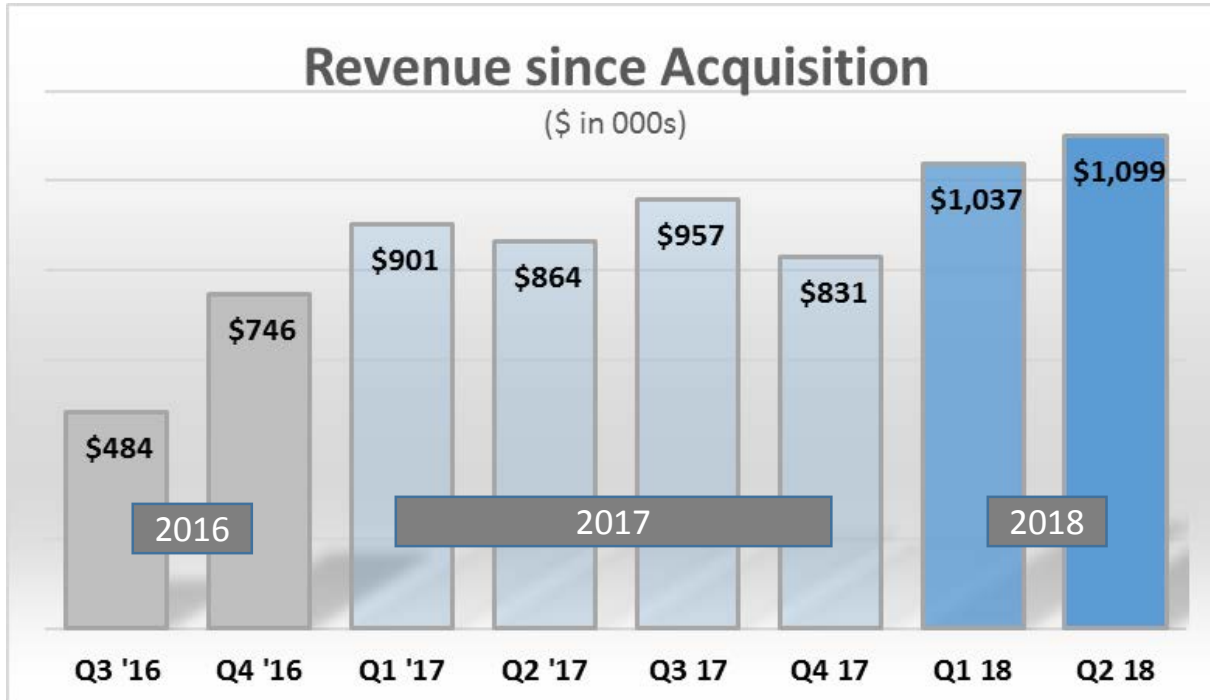
Blood Circuit Set



Dual Lumen venous catheter



Revenue Performance



Since completing the acquisition of Aquadex in August 2016, we have focused on executing our strategy and on growing revenue.

Capitalization Table

As of July 3, 2018

Instrument	Shares	Comments
Common Shares	<u>7,053,122</u>	Nasdaq: CHFS
Common Stock Equivalents		
Series F Convertible Preferred	287,920	Convertible at \$2.12; anti-dilution rights
Warrants, Series F	8,026,216	WAEP \$2.12; Exp Nov. 2019-Nov. 2024
Warrants, all other	496,468	WAEP \$26.10; Exp Feb. 2022-Feb 2025
Options	2,128,296	WAEP \$4.90
RSUs	<u>135</u>	
Total	<u>10,938,910</u>	
Fully Diluted Shares	17,992,032	

Key Growth Opportunities Exist

Aquadex Growth Drivers

1 **Established Customer Base**

Opportunity to expand utilization within our current customer base of 300+ hospitals

2 **Underpenetrated Inpatient Market**

900,000 annual U.S. HF admissions for fluid overload, 68% achieving sub-optimal results with diuretics provide an inpatient opportunity of $\geq 600,000$ patients/year

3 **Untapped Outpatient Market**

Medicare penalties for early readmissions is driving a growing outpatient market with $\approx 300,000$ treatments per year in U.S. alone

4 **OUS Growth Opportunity**

OUS market largely untapped to date, offering long-term growth potential

5 **Multiple Clinical Applications**

Aquadex removes excess fluid in patients with a variety of fluid management issues

6 **Alignment with Market Dynamics**

Readmission rates and length of stay benefits of Aquadex are in line with the market shift toward value-based technology

7 **Dedicated Reimbursement Codes**

Producing clinical data and assimilating existing data can achieve dedicated outpatient codes and drive market uptake



For More Information

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