Single-Source Solutions for Digital Respiratory Management

Adherium is entering a potentially transformational phase. Its revised strategy is focused on multi-channel B2B2C opportunities in the management of patients with 'difficult-to-treat' asthma and COPD. Adherium's new flexible, highly scalable Hailie® platform incorporates an expanded suite of devices (now 10), including the first FDA-cleared sensor on the market to offer respiratory flow rate data and track adherence. As such, Adherium is well positioned to benefit from reimbursement changes and the surge in adoption of remote patient care monitoring programs due to the COVID-19 pandemic.

Focusing on high-risk asthma, COPD patients

Non-adherence is especially challenging in 'difficult-to-treat' asthma and late-stage COPD patients, the consequences of which are poor health outcomes, unnecessary escalation of rescue medication, ED visits and hospital admissions. These patients typically carry the greatest risk of acute attacks and absorb the most physician time, hospital resources and costs to the healthcare system. In the US, this population equates to a serviceable addressable market of ~ 8.5m individuals.

Hailie® sensors improve clinical outcomes

Multiple clinical trials have shown significantly improved adherence rates and clinical outcomes with Adherium's proprietary Hailie® sensor technology interventions. Adherium's next-generation Hailie® SaaS platform combines this technology with multiple complimentary devices and data feeds that create an end-to-end (single source) solution for managers of patients with chronic respiratory disease.

Physiological measures lift reimbursement

The first of Adherium's next-generation Hailie® sensors with physiological measures has received FDA 510(k) clearance, providing access to Remote Patient Monitoring (RPM) reimbursement codes introduced in 2019 in the US (for physiological data). In addition, all Hailie® sensors qualify for reimbursement under the new Remote Therapeutic Monitoring (RTM) codes (for non-physiological data).

Leveraging Big Data: Unlocking the cloud

Expansion of data points tracked, analysed, and stored in Adherium's cloud represent a significant source of future value for healthcare practitioners and patients. As patient numbers grow, Adherium plans to exploit this accumulating data in its cloud to develop optimal disease management strategies based on usage patterns.

Valuation

We value Adherium at A$114m, or $0.03 per share, using DCF methodology on free cash flow. This assumes the company will raise A$15m in FY23 by issuing an additional 1.5b shares at the current share price of $0.01. Key risks include competition, customer mix, and resource and capital allocation.

Adherium is an ASX-listed digital health company specialising in remote e-health devices and data analytic services, focused on patient adherence, remote monitoring and data management solutions for patients, physicians, payers and providers. Its expanded digital sensor coverage and cloud-based SaaS Hailie® platform offer a single-source solution to optimise management of patients with chronic respiratory diseases, specifically difficult-to-treat and severe asthma and COPD.

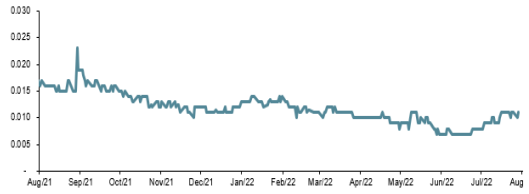
www.adherium.com

Stock	ADR.ASX
Price	A$0.01
Market cap	A$24m
Valuation	A$0.03

Company data	
Cash on hand (30 June 2022)	A$5.3m
Shares on issue	2,129m
Options and rights outstanding	310.9m

Potential catalysts
Late August 2022: FY22 result
CY22: FDA clearance of next-gen Hailie sensors
CY22: New technologies on platform

ADR share price (A$)



Source: FactSet.

Chris Kallos, CFA
chris.kallos@mstaccess.com.au

Financial Summary

Exhibit 1 – Financial summary

Adherium ADR-AU

Year end 30 June, AUD unless otherwise noted

MARKET DATA		
Price	$	0.01
52 week high / low	$	0.01-0.04
Valuation	$	0.03
Market capitalisation	$m	23.4
Shares on issue (basic)	m	2125.7
Options / rights	m	310.9
Other equity	m	0.0
Shares on issue (diluted)	m	2436.6

12-MONTH SHARE PRICE PERFORMANCE (A$)

INVESTMENT FUNDAMENTALS		FY19A	FY20A	FY21A	FY22E	FY23E
Reported NPAT	$m	(11.8)	(11.4)	(15.0)	(10.6)	(10.1)
Underlying NPAT	$m	(11.8)	(11.4)	(15.0)	(10.6)	(10.1)
Reported EPS (diluted)	¢	(680.0)	(360.0)	(170.0)	(50.1)	(47.3)
Underlying EPS (diluted)	¢	(680.0)	(360.0)	(170.0)	(50.1)	(47.3)
Growth	%		-47.1%	-52.8%	-70.5%	-5.5%
Underlying PER	x	nm	nm	nm	nm	nm
Operating cash flow per share	¢	(6.8)	(2.3)	(1.3)	(0.6)	(0.5)
Free cash flow per share	¢	(6.7)	(2.4)	(1.3)	(0.6)	(0.5)
Price to free cash flow per share	x	nm	nm	nm	nm	nm
FCF Yield	%	nm	nm	nm	nm	nm
Dividend	¢	0.0	0.0	0.0	0.0	0.0
Payout	%	0.0%	0.0%	0.0%	0.0%	0.0%
Yield	%	0.0%	0.0%	0.0%	0.0%	0.0%
Franking	%	0.0%	0.0%	0.0%	0.0%	0.0%
Enterprise value	$m	22.6	18.8	8.2	21.1	16.7
EV/EBITDA	x	(2.0)	(2.1)	(0.6)	(1.9)	(1.7)
EV/EBIT	x	(1.9)	(2.1)	(0.6)	(1.9)	(1.7)
Price to book (NAV)	x	2.2	2.0	1.7	11.8	4.8
Price to NTA		2.5	2.0	1.7	11.8	4.8

KEY RATIOS		FY19A	FY20A	FY21A	FY22E	FY23E
EBITDA margin	%	nm	nm	nm	nm	nm
EBIT margin	%	nm	nm	nm	nm	nm
NPAT margin	%	nm	nm	nm	nm	nm
ROE	%	nm	nm	nm	nm	nm
ROA	%	nm	nm	nm	nm	nm
Net tangible assets per share	$	0.0	0.0	0.0	0.0	0.0
Book value per share	$	0.0	0.0	0.0	0.0	0.0
Net debt/(cash)	$m	(0.8)	(4.6)	(15.2)	(2.3)	(6.7)
Interest cover/ (EBIT/net interest)	x	nm	nm	nm	nm	nm
Gearing (net debt/EBITDA)	x	nm	nm	nm	nm	nm
Leverage (net debt/(net debt + equity))	x	nm	nm	nm	nm	nm

DUPONT ANALYSIS		FY19A	FY20A	FY21A	FY22E	FY23E
Net Profit Margin	%	nm	nm	nm	nm	nm
Asset Turnover	x	1.2	0.3	0.0	0.2	0.3
Return on Assets	%	nm	nm	nm	nm	nm
Financial Leverage	x	0.0	0.0	0.0	0.0	0.0
Return on Equity	%	nm	nm	nm	nm	nm

HALF YEARLY DATA		2H20	1H21	2H21	1H22	2H22
Total Revenue	$m	0.8	0.2	0.5	1.8	1.0
Operating expenses	$m	(6.1)	(8.6)	(5.0)	(6.9)	(6.4)
EBITDA	$m	(5.3)	(8.4)	(4.5)	(5.1)	(5.8)
EBIT	$m	(5.4)	(8.4)	(4.6)	(5.1)	(5.8)
PBT	$m	(2.8)	(8.4)	(2.4)	(5.1)	(5.5)
Reported NPAT	$m	(2.8)	(8.4)	(2.4)	(5.1)	(5.5)

PROFIT AND LOSS		FY19A	FY20A	FY21A	FY22E	FY23E
Revenue	$m	2.8	2.2	0.4	0.8	3.0
Other income	$m	0.3	0.0	0.4	2.0	1.3
Total Revenue	$m	1.0	1.0	1.4	2.8	4.3
Operating expenses	$m	(12.1)	(6.5)	(5.5)	(6.3)	(5.2)
EBITDA	$m	(11.4)	(9.1)	(13.0)	(10.9)	(10.1)
Depreciation & Amortisation	$m	0.4	0.3	0.1	0.1	0.1
EBIT	$m	(11.9)	(8.8)	(12.8)	(10.9)	(10.0)
Net interest	$m	0.1	(2.6)	(2.2)	0.3	0.0
Pretax Profit	$m	(11.8)	(11.4)	(15.0)	(10.6)	(10.1)
Tax expense	$m	0.0	0.0	0.0	0.0	0.0
Reported NPAT	$m	(11.8)	(11.4)	(15.0)	(10.6)	(10.1)
Weighted average diluted shares	m	173.9	316.0	901.0	2,125.7	2,125.7

GROWTH PROFILE		FY19A	FY20A	FY21A	FY22E	FY23E
Revenue	%	(80.4)	0.0	39.4	95.2	51.6
EBITDA	%	23.1	(25.7)	45.5	(15.0)	(8.3)
EBIT	%	22.4	(19.9)	41.8	(15.6)	(7.7)
Reported NPAT	%	26.3	(3.4)	31.9	(29.2)	(5.5)
DPS	%	nm	nm	nm	nm	nm

BALANCE SHEET		FY19A	FY20A	FY21A	FY22E	FY23E
Cash	$m	0.8	4.6	15.2	2.3	6.7
Receivables	$m	0.4	0.6	0.6	0.3	1.2
Other	$m	0.6	1.3	1.2	1.2	1.2
Current assets	$m	1.8	6.5	16.9	3.8	9.0
PPE	$m	0.4	0.2	0.1	0.4	0.3
Intangible assets	$m	0.1	0.0	0.0	0.0	0.0
Other	$m	0.0	0.0	0.0	0.0	0.0
Non current assets	$m	0.5	0.2	0.1	0.4	0.3
Total assets	$m	2.2	6.7	17.0	4.2	9.3
Trade and other payables	$m	1.4	2.6	2.3	0.1	0.3
Borrowings	$m	0.0	0.0	0.0	0.0	0.0
Other	$m	0.0	0.7	0.7	0.7	0.7
Current liabilities	$m	1.4	3.3	3.0	0.8	1.0
Other financial liability	$m	0.0	0.0	0.0	0.0	0.0
Other liability	$m	0.0	0.0	0.0	0.0	0.0
Non current liabilities	$m	0.0	0.0	0.0	0.0	0.0
Total liabilities	$m	1.4	3.3	3.0	0.8	1.0
Net assets	$m	0.8	3.4	14.0	3.4	8.3
Share capital	$m	74.3	87.7	110.2	110.2	125.2
Retained earnings	$m	(47.0)	(58.3)	(73.4)	(84.0)	(94.1)
Other	$m	(26.6)	(25.9)	(22.8)	(22.8)	(22.8)
Total equity	$m	0.8	3.4	14.0	3.4	8.3

CASH FLOW		FY19A	FY20A	FY21A	FY22E	FY23E
Net loss for period	$m	(11.8)	(11.4)	(15.0)	(10.6)	(10.1)
Depreciation & Amortization	$m	0.4	0.3	0.1	0.1	0.1
Changes in working capital	$m	(0.1)	0.3	0.0	0.0	0.0
Other	$m	(0.3)	3.4	3.6	(2.0)	(0.7)
Operating cash flow	$m	(11.8)	(7.3)	(11.3)	(12.6)	(10.6)
Payments for PPE	$m	0.0	0.0	0.0	0.0	0.0
Other	$m	0.1	(0.1)	(0.0)	(0.3)	(0.0)
Investing cash flow	$m	0.1	(0.1)	(0.0)	(0.3)	(0.0)
Equity	$m	0.0	11.4	22.9	0.0	15.0
Other	$m	0.0	(0.1)	(1.0)	0.0	0.0
Financing cash flow	$m	0.0	11.3	21.9	0.0	15.0
Cash year end	$m	0.8	4.6	15.2	2.3	6.7
Free cash flow	$m	(11.7)	(7.5)	(11.3)	(12.9)	(10.7)

Source: Company, MST Access.

Investment Thesis: Developing Digital Solutions for Remote Respiratory Management

Company Profile: Respiratory eHealth Specialist with Platform Solution

Adherium is a commercial-stage digital health technology company headquartered in Melbourne, Australia. The company develops and commercialises technologies that address suboptimal medication use and remote patient monitoring and data management solutions in chronic respiratory disease. The company's Hailie® solution uses proprietary inhaler-attaching sensor technology and a flexible service delivery cloud-based platform to support management of high-risk patient populations with chronic respiratory conditions such as 'difficult-to-treat' asthma and late-stage chronic obstructive pulmonary disease (COPD).

Company history: IPO and cornerstone AstraZeneca alliance added valuable experience

Adherium was founded by previous CEO Garth Sutherland in 2001 as Nexus6 and brought its first product to market in 2003. The company achieved 510(k) market clearance in 2009, introduced Bluetooth low-energy technology in 2012, and provided objective inhaler data capture in numerous clinical studies before listing on the ASX in 2015. The IPO raised A$35m, supporting further product development of the company's then Smartinhaler™ sensor range, along with branded sensor supply to key commercial client and multinational pharmaceutical company AstraZeneca (AZN). The company launched its first apps and portal in 2016. Adherium's initial AZN agreement characterised the company's main commercialisation strategy at the time, which relied on the sale of devices to international pharmaceutical companies, which in turn would provide them to patients via their distribution networks.

New business model redefines strategic focus: Delivering remote patient monitoring solutions to managers of high-risk populations with chronic conditions

Adherium's transition to a medication adherence and data management platform provider widens its market scope to include all managers of large patient populations with chronic respiratory disease in the US healthcare value chain, such as integrated delivery networks, hospitals, and physician groups. Given the number of patients covered, these managers provide an opportunity to scale rapidly. The availability and recent expansion of reimbursement in the US for RPM (for physiological data) is also a key change in the market that supports adoption of Adherium's Hailie® solution. We think successful deployment of the Hailie® platform with these companies and the release of value-adding enhancements, including physiological measures, will attract more clients and allow the company to realise its true value.

Adherium's current portfolio of sensors covers 91% of the market (18 of the top 20 branded inhaler medications) vs 71% in 2021. This has been driven by (1) an expanded US reimbursement landscape with the new 2022 RTM code set published in January 2022, (2) a shift in the market share ranking of inhaler medications now covered by Adherium sensors, expanded by (3) Adherium obtaining FDA 510 (k) clearance in July 2022 to market the connection of GlaxoSmithKline's (GSK) Ellipta® inhaler with the Hailie® sensor with physiological parameters to monitor asthma/COPD medication use.

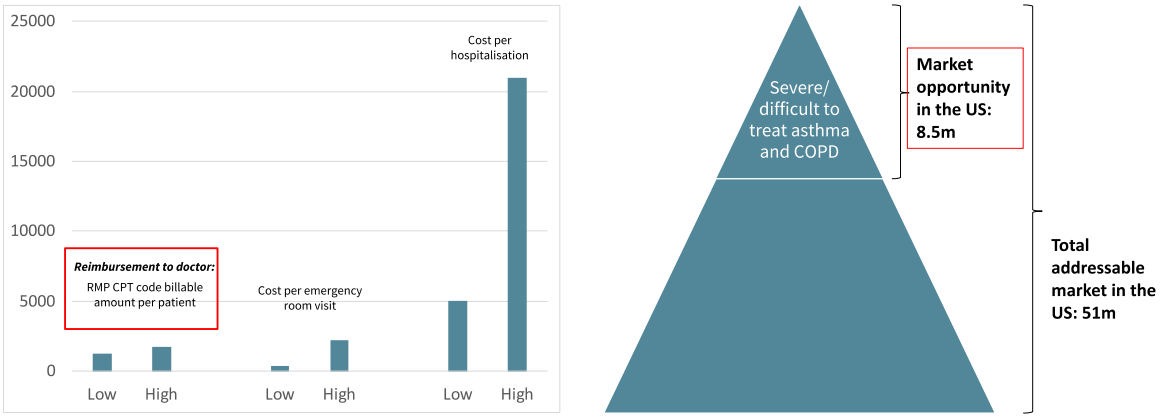
Exhibit 2 – Adherium corporate roadmap – Leveraging strategic partnerships and building scale

Source: Adherium.

Market Opportunity – 8.5 Million Asthma and COPD Patients in the US Alone

Adherium estimates the total addressable market in the US for asthma and COPD to be in the order of 51m patients (25m asthma and 26m COPD patients), of which 8.5m are considered severe and difficult to treat.

Exhibit 3 – Compelling health economic benefit – Reimbursement vs cost of ER visits and hospitalisation



Source: Adherium.

COVID-19 surge in mHealth transitions to RPM platform solutions as multiple drivers align

Digital health – particularly mobile health (mHealth), the sub-sector in which Adherium operates – has seen explosive growth over the past 10 years. Lifestyle-, consumer health– and wellness-related apps and devices drove a 42% CAGR (5 years to 2020) in the mHealth market (as per Statista). Nonetheless, even with a COVID-19–related adoption surge, we believe mHealth still has a lot of growth ahead, given its underrepresentation in clinical settings, where it has been adopted much more slowly. This looks set to change; reimbursement is increasing as new codes are utilised, clinical evidence is mounting for the efficacy of mHealth tools, new applications and increasing utility of big data analytics in the mHealth space are improving patient outcomes, and the impetus created by the COVID-19 pandemic is forcing clinicians to overcome their previous reluctance to use these tools and services.

Financials – Multi-channel B2B2C strategy expands recurring revenue model

With 510 (k) clearances now reflecting 91% coverage of the US market's top 20 branded inhaler medications, and an integrated, flexible, and highly scalable digital platform allowing multiple data inputs, Adherium is well positioned to offer a single-source solution to multiple B2B2C customer channels and capitalise on the surge in RPM created by COVID-19. A major trend towards value-based reimbursement models could fuel rapid adoption of the Hailie® platform after initial trialling with a parallel enrichment of datasets offering further revenue opportunities downstream as the value of data to inform and guide patient management matures. As such, we see Adherium's revenue model expanding in time to include an increasingly diversified revenue stream generated by device sales, SaaS, software licencing, clinical trials support and monetising of data science. This should support multiple revenue models based on SaaS and data fees, per member/per month (PMPM) fees, increased serviceable patient penetration and value-based incremental pricing.

Valuation

We value Adherium at A$114m, or $0.03 per share, using DCF methodology on free cash flow. This assumes the company will raise A$15m in FY23 by issuing an additional 1.5b shares at the current share price of $0.01. Key risks include competition, customer mix, and resource and capital allocation.

Risks and Sensitivities

Adherium is operating in a relatively new and rapidly evolving segment of digital health. Commercialisation is still at an early stage and therefore exposes investors to various risks related to competition, customer mix, resource and capital allocation, product development, regulatory approval, and reimbursement.

Product Strategy: Sensors & Smart Inhalers and Platform: Refining the Offering for Growing Severe Asthma + COPD Market

Adherium's digital health technologies aim to improve management of chronic respiratory diseases by addressing patients' suboptimal use of inhaled prescription medication. The company is a leading developer, manufacturer, and supplier of remote eHealth tools using proprietary sensors and software to track medication usage and generate accurate data to help physicians manage their patients with chronic respiratory disease – specifically, asthma and chronic obstructive pulmonary disease (COPD).

Medication adherence, or the extent to which patients take medications as prescribed, is a key issue in managing the care of patients experiencing chronic illness. In asthma, this usually refers to how many prescribed medication doses are actually used (vs prescribed), where the preventer (maintenance) medication is typically an inhaled corticosteroid (ICS). Despite the influx of novel biological therapies, ICSs remain the mainstay in maintenance therapy of severe asthma and in managing acute exacerbations. Further, suboptimal adherence to ICSs is the most common reason for treatment failure in asthma.

The Problem: Why Medication Adherence Matters

Suboptimal medication adherence occurs when patients do not take the correct amount of their prescribed medication at the correct time with the correct technique. Suboptimal medication adherence can lead to:

- compromised treatment effectiveness and disease progression
- diminished quality of life for patients, as well as increased morbidity and death
- added economic burden on public and private healthcare systems
- suboptimal use of prescribed medication and unrealised drug sales.

Poor medication adherence is particularly problematic for asthma and COPD patients

Despite the availability of effective long-term therapies, poor adherence remains a significant challenge to optimal asthma control and a major cause of asthma mortality globally. Asthma is a chronic inflammatory respiratory condition affecting ~10% of the population, whereas COPD affects 5% of adults over 45 (see Appendices 2–3).

Of the ~51m Americans with asthma/COPD, 8.5m are classified as 'severe'/'difficult to treat' (asthma) or 'late stage' (COPD). These patients have the highest burden of care and cost to healthcare systems, and typically are readmitted to hospitals within 30 days, with added cost from penalties levied by payers on physicians.

Non-adherence to asthma medication is driven by a multitude of factors, including:

- patients not understanding the distinction between preventer (maintenance) and reliever inhalers
- perceived lack of impact of asthma on daily life adding to uncertainties around accuracy of diagnosis
- poor inhaler technique
- concerns about ICS side effects
- the cost of medication, which for many patients can lead to self-rationalisation.

Nonadherence rates among asthmatics are 30%–70%[1], representing an important cause of exacerbations and attacks. A study of young Australian adults receiving 2+ prescriptions of fixed-dose combination ICSs and long-acting[2] beta$_2$-agonist therapy in the prior year showed only 11% had controlled asthma and only 43% of users with prescribed preventatives reported everyday use[3].

Adherence monitoring underpins successful management of severe respiratory diseases

Non-adherence is especially challenging in severe/difficult-to-treat asthma and late-stage COPD, leading to poor health outcomes, unnecessary escalation of medication and higher healthcare costs. Getting the right treatment at the right time is critical in these patients and impacts whether to progress to more expensive biologic therapies.

[1] Nonadherence in difficult asthma – facts, myths, and a time to act: Lindsay and Heaney

[2] Compared with short-acting beta$_2$-agonists which are often used as relievers

[3] Management and treatment perceptions among young adults with asthma in Melbourne: Reid et al

Digital interventions improve medication adherence in asthma therapy

Digital health technologies are transforming the practice of medicine and – as seen with COVID-19 – are ideally suited for remote patient monitoring and management of chronic disease more broadly. The use of digital health interventions in tracking medication adherence has been trending for almost a decade, underpinned by increasingly sophisticated smartphones, sensors, and cloud-based computing options, which have spawned a raft of technological solutions. Common themes underlying mobile health strategies include treatment adherence, behaviour modification, appointment reminders, and data collection via self-reporting or remote biosensors. Exhibit 4 highlights a range of mobile health tools devoted to adherence.

Exhibit 4 – Digital health and medication adherence – selected companies by similar category

Category	Description	Selected companies
Virtually Observed Therapy	Using facial recognition technology to determine if a patient swallowed their medication	Emocha Mobile Health, sureAdhere
Bioingestible Sensors	Tablet or capsule-enabled sensors that can contain a drug	Proteus Digital Health, EtectRx
Smart Pill Bottles	Cellular enabled bottles that transmit data in real-time when opened	AdhereTech, GlowCap, Pillsy, Medikyu
Smart Pill Organizers	Companies deploying anything from smart pill boxes to smart automatic pill dispensers	TowerView Health, MedMinder, Vaica
Home Assistant	Integration of home voice assistant programs into a medication adherence platform	Pillo, Catalia Health , Spencer Health Solution
Patient Reward Platforms	Reward based behavioural reinforcement using mobile app	Wellth, Sempre Health, HealthPrize, Mango Health
Smart Injectable Devices (Diabetes focus)	Track adherence with injectables when the needle/syringe/pen is dispensed	Insulog, Companion Medical , Gocap, SmartPlus, DiabNext
Inhaler e-Monitoring	Electronical monitor medication adherence upon actuation through app and an online platform	Adherium, Propeller, Teva
Blister Pack Adherence	Track removal of medications from a blister pack using movement, touch, sound	Popit, MediSafe, Aavia
Mobile Health, or mHealth, Applications	Personalised medication management including reminders, educational content, and biometrics	Medisafe, AiCure.LLC, MedAdvisor,The Pharmacy Guild of Australia (Industry Body)

Source: MST Access.

Adherium's Hailie® sensors are examples of electronic monitoring of inhalers, which are the most relevant digital health tools to the management of chronic respiratory disease given the reliance on inhaled medications in treatment. In general, these products are devices with built-in sensors that clip onto metered dose inhalers. Users automatically activate the sensor when taking their medication and captured data is uploaded for both patient and clinical review. Users and clinicians can monitor adherence in real time through online platforms and apps. These inhalers typically provide reminders and feedback to improve adherence.

Market Opportunity: Inhaled Respiratory Drugs for Asthma and COPD

Asthma medications are usually formulated as inhalers, grouped into relievers and preventers. **Relievers** are fast-acting asthma medications that provide quick relief from the symptoms of asthma – wheeze, chest tightness, cough, and shortness of breath. These medications, typically bronchodilators such as short-acting beta 2 agonists, relax and open the airway muscles, making it easier for patients to breathe in minutes with effects lasting for up to 4 hours. **Preventers**, most commonly low-dose ICSs, control asthma symptoms and prevent attacks. ICSs are the most effective anti-inflammatory of these used for long-term management.

Asthma treatment typically involves a combination of relievers and preventers

Asthma management typically involves a combination of relievers and preventers tailored to the individual patient. ICSs, used either as a single agent or in combination with long-acting bronchodilators, are the standard treatment for long-term asthma control. Management is based on continual review and adjustment of medication with ongoing assessment of symptoms, risk factors, comorbidities, inhaler technique and adherence. Preventers take several days or even weeks to work, so are not designed for quick relief of symptoms. As such, low adherence to preventer medications is typically associated with suboptimal control of symptoms and poor outcomes in asthma, including acute attacks requiring hospitalisation and mortality.

By addressing medication adherence for this segment of the market, with a focus on the preventer category in both asthma and COPD, Adherium has identified an opportunity to add substantial value to the practice of personalised care of patients and the goal of improved clinical outcomes and reduced costs of care.

Targeting better use of inhaled drugs for asthma and COPD – a large and growing market

We think Adherium's sensors are a natural companion to almost all inhaled prescribed medications for asthma and COPD, a large and growing market. The global inhalable drug market, which includes

suspension aerosol, solution aerosol and dry powder formulations, is growing at 6.4% CAGR and is projected to reach US$41.5 bn by 2026.[4]

Global asthma treatment sales in 2019 totalled almost US$20 bn[5], with sales of AZN's Symbicort® ~US$ 2.7 bn as in FY20. Notably, most sales (by volume) of inhalers are preventative, highlighting the chronic nature of asthma for most patients.

Exhibit 5 – USA inhaler medication market share by product and manufacturer (2021)

Inhaler	Drug	Class	Type	Indication	Manufacturer	% Market Share
Albuterol HFA generic	albuterol (salbutamol)	SABA	Reliever	Asthma/COPD	Teva Pharmaceutical Industries Ltd	18.7%
Symbicort (HFA & Turbuhaler)	formoterol/budesonide	Combination	Preventer	Asthma/COPD	AstraZeneca Plc	11.2%
Ventolin HFA	albuterol (salbutamol)	SABA	Reliever	Asthma/COPD	GlaxoSmithKline Plc	9.6%
ProAir HFA	albuterol (salbutamol)	SABA	Reliever	Asthma/COPD	Teva Pharmaceutical Industries Ltd	9.5%
Breo Elipta - Elipta	fluticasone/vilanterol	Combination	Preventer	Asthma/COPD	GlaxoSmithKline Plc	8.0%
Flovent HFA	fluticasone	ICS	Preventer	Asthma	GlaxoSmithKline Plc	7.6%
Advair Diskus	fluticasone/salmeterol	Combination	Preventer	Asthma/COPD	GlaxoSmithKline Plc	6.9%
Trelegy Elipta - Elipta	fluticasone/umeclinidium/vilanterol	Combination	Preventer	COPD	GlaxoSmithKline Plc	5.7%
Spiriva Handihaler	triotropium	ACS	Preventer	COPD	Boehringer Ingelheim	4.2%
Spiriva Respimat	triotropium	ACS	Preventer	Asthma/COPD	Boehringer Ingelheim	4.0%
Anoro Elipta - Elipta	umeclinidium/vilanterol	Combination	Preventer	COPD	GlaxoSmithKline Plc	3.3%
Incruse Elipta - Elipta	umeclinidium	ACS	Preventer	COPD	GlaxoSmithKline Plc	2.5%
Combivent Respimat - Respimat	ipratropium/albuterol	Combination	Preventer	COPD	Boehringer Ingelheim	2.2%
Advair HFA	fluticasone/salmeterol	Combination	Preventer	Asthma	GlaxoSmithKline Plc	2.1%
Stiolto Respimat	olodaterol/triotropium	Combination	Preventer	COPD	Boehringer Ingelheim	1.2%
Arnuity Elipta - Elipta	fluticasone	ICS	Preventer	Asthma	GlaxoSmithKline Plc	1.1%
Flovent Diskus	fluticasone	ICS	Preventer	Asthma	GlaxoSmithKline Plc	0.5%
ProAir Respiclick	albuterol (salbutamol)	SABA	Reliever	Asthma/COPD	Teva Pharmaceutical Industries Ltd	0.5%
Proventil HFA	albuterol (salbutamol)	SABA	Reliever	Asthma/COPD	Merck & Co. Inc	0.4%
Breztri Aerosphere	budesonide/glycopyrronium/formoterol	ICS/LABA/LAMA	Preventer	COPD	AstraZeneca Plc	0.4%
Bevespi Aerosphere	formoterol/glycopyrrolate	LABA	Preventer	COPD	AstraZeneca Plc	0.3%
Proair Digihaler	albuterol (salbutamol)	SABA	Preventer	COPD	Teva Pharmaceutical Industries Ltd	0.0%
						100.0%

Source: Adherium, IQVIA, MST Access.

Current Product Offering:
Adherium Leverages Adherence Problem + Respiratory Market Opportunity

Inhaler e-monitoring sensors are registered medical devices that clip onto a prescription inhaler, and can typically:

- **track:** record date and time of inhaler use, independent of patient actions
- **assess:** physician-assessed inhaler technique including quality of inhalation, aiming to identify and overcome poor medication adherence
- **remind:** transmit audio and visual reminders when the patient has missed a critical dose of a prescribed medication
- **share:** transmit that data to a mobile device (where it can be viewed by the patient in an application) and send it to a cloud-based server (where it can be accessed by the patient's medical provider or physician via a secure web portal)
- **warn:** provide warnings when patient usage indicates the patient's disease may be mismanaged.

Adherium's inhaler monitoring system – the Hailie® solution

Adherium was amongst the first developers of inhaler e-monitoring technology for monitoring adherence, with its first product range, the Smartinhaler™ platform, receiving FDA approval in 2009.

[4] https://www.acumenresearchandconsulting.com/inhalable-drugs-market
5 https://www.fortunebusinessinsights.com/industry-reports/asthma-treatment-market-101039

The platform comprised a range of inhaler e-monitoring devices housing different sensors customised for different pharmaceutical company proprietary inhalers, both pressurised metered dose inhalers and dry powder insufflation delivery systems. These sensors attach to prescription inhalers to monitor inhaler actuation and can provide audio and visual medication reminders, as well as the proprietary firmware which integrates the data from the inhaler e-monitor device, via Bluetooth® wireless technology to a companion mobile application, and then onto a cloud-based server where it can be accessed by the patient's medical provider or physician via a secure web portal.

In 2018, the Smartinhaler™ platform was relaunched under the Hailie® global brand to coincide with its then B2C push into the US market. The rebranded offering included a free Hailie® app, an asthma and COPD tracking solution developed for both iOS and Android, with a portal for healthcare professionals and clinicians (https://go.hailie.com).

Exhibit 6 is a simplified overview of Adherium's current product offering – the Hailie solution® – comprising Bluetooth®-enabled sensors, a mobile application, and a secure cloud-based portal. (Note: this section relates to the Hailie® product currently on the market. The next section covers the next-generation model with its physiological measures, technique monitoring and other features).

Exhibit 6 – Overview of the Hailie® solution: sensor (left), app (centre), web portal (right)

Source: Adherium.

Including the next-gen Hailie® sensor with physiological measures for AstraZeneca's Symbicort® pMDI and GSK pMDI inhalers, Adherium's sensor product range now totals 10.

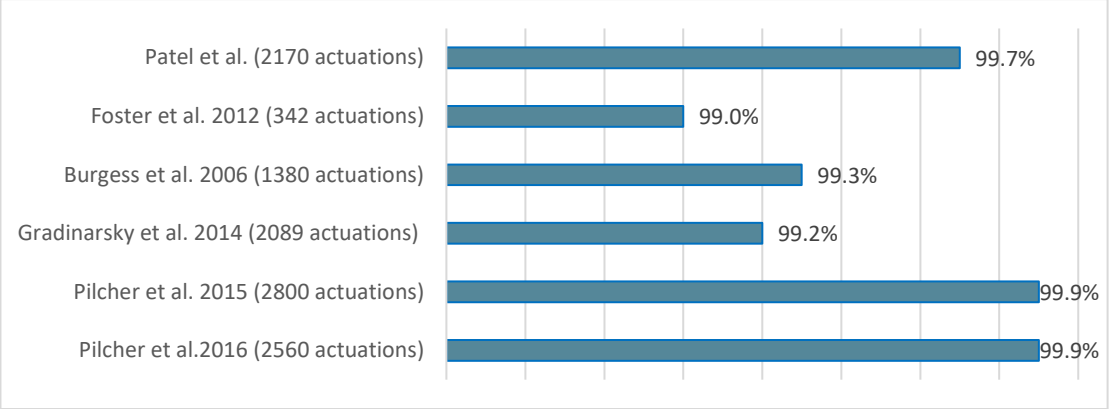
Exhibit 7– The Hailie® solution sensor range

Source: Adherium.

Validation of accuracy – clinical studies show accuracy of Hailie® sensors greater than 99%

Six independent validation studies (see Exhibit 8), designed to assess the accuracy of the current generation of Hailie® sensors in capturing medication use, showed the Hailie® solution was at least 99% accurate.

Exhibit 8 – Hailie® validation studies: Hailie® sensors accurately capture medication use



Source: Adherium.

Validation of efficacy – clinical data confirms Hailie® solution improves adherence, drives better health outcomes

The Hailie® sensor has also been referenced in more than 100 independent peer-reviewed publications involving over 13,000 patients. These include clinical trials in which the Hailie® sensor was used as the gold standard method for measuring adherence, validation studies of accurately capturing medication use and clinical trials assessing the efficacy of Hailie® interventions. Five clinical trials with a total of 589 patients have reported significant improvements in adherence rates with Hailie® interventions (see Exhibit 9). Notably, Chan et al (2015) reported a 180% increase in preventer medication adherence.

Exhibit 9 – Clinical studies show that Hailie® technology improves adherence

Dates	Author	Study	Purpose	Notes
2015	Chan et al.	Suboptimum adherence to preventive asthma treatment study	Assessed the effect of an electronic monitoring device with audiovisual reminder function on adherence to inhaled corticosteroids and school attendance in children with asthma: a randomised controlled trial.	180% increase in preventer medication adherence.
2007	Charles et al.	Study on the effect of Hailie reminders on adherence	The effect of Hailie reminders on adherence by setting audio-visual reminders for the intervention groups of the study population.	Improvements in adherence were sustained.
2014	Foster et al.	Study on the effect of two strategies aimed at improving adherence to preventer medication	The effect of Hailie reminders on adherence by setting audio-visual reminders for the intervention groups of the study population.	Participants in the two feedback groups were 59% more adherent than those in the non-reminder groups taking 1.5 times more preventer medication.
2016	Morton et al.	Study on ICS medication regimes in patients with asthma	To investigate if improved adherence to ICS medication regimes in patients with asthma would lead to improved clinical outcomes.	39% reduction in oral steroid use in children, 80% reduction in hospital admissions in children, 10% fewer unplanned attendences at GP or ED, 26% reduction in days off school due to asthma.
2010	Burgess et al.	Study on the effect of providing adherence feedback to participants with asthma	The effect of providing adherence feedback (made possible by Hailie sensor data) to participants at monthly reviews with their clinician.	Reported that the improvements in adherence were sustained.

Source: www.ncbi.nlm.nih.gov/.

Next-Generation Product Offering: Hailie® Sensor to Have Deeper Monitoring Capabilities

New product development is currently focused on three key areas:

- development of next-generation sensors across an expanded range of inhaler brands. Notably, management has been successful over the last 12 months in expanding the number of FDA approvals for inhaled medication sensors capturing both adherence and physiological parameters increasing coverage to 91% of the top 20 US branded medications, up from 71% in 2021
- improved technique by patients to promote adherence
- addition of physiological data to support reimbursement under RPM CPT codes.

Standard parameters – tracking adherence and user technique

All Hailie® sensors currently offer a set of standard measurements that allow remote monitoring of adherence and user technique. Correct use of inhalers makes each dose substantially more effective and uniform, which helps the healthcare provider assess and develop an appropriate asthma care plan for the patient. Measurements/indicators include:

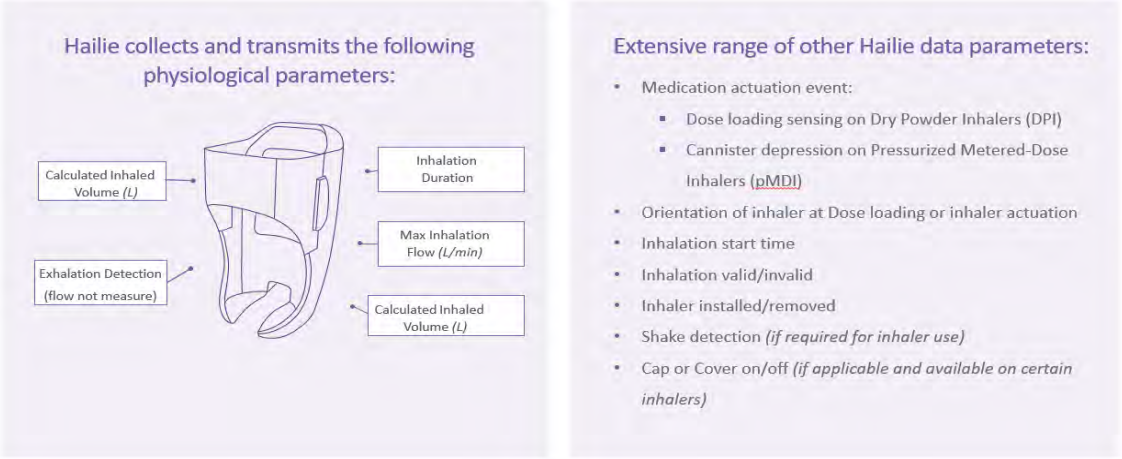
- whether inhaler is installed into the Adherium jacket/removed
- medication actuation event of the two main types of inhalers: (1) dose loading sensing on dry powder inhalers (DPIs) (opening/closing of the inhaler cover or rotations of inhaler body); (2) cannister depression on metered dose inhalers (pMDIs)
- orientation of inhaler at dose loading or inhaler actuation
- cannister depression on metered dose inhalers (pMDIs)
- shake detection (if required for inhaler use)
- cap or cover on/off (available on certain inhalers).

New physiological parameters – adding functionality, access to reimbursement in the US

The Hailie® solution will measure a range of physiological measures that meaningfully impact the efficacy of inhaled asthma medication and therefore are a key part of adherence monitoring. These measures qualify the device for reimbursement under Current Procedural Terminology (CPT) codes introduced by the CMS in the US for remote patient monitoring. The measures, which will be time-stamped, will include:

- peak inspiratory (inhalation) flow rate (L/min) (min/max and average)
- inhalation volume (L) and duration (seconds)
- number of inhalations.

Exhibit 10 – Hailie® physiological and non-physiological parameters



Source: Adherium.

Hailie® Sensors and Platform Create Single-Source Solution

Central to Adherium's revised commercial strategy has been the development of the Hailie® platform. Adherium's Hailie® platform supports the integration of multiple complimentary devices and data feeds that create clinical synergies to deliver a single-source solution for both managers of high-risk patients with chronic respiratory disease and payors of healthcare costs related to these patient populations. This essentially creates a platform-as-a-service model which diversifies the company away from previous product-only revenues and paves the way for recurring revenues similar to SaaS model companies. The consolidated offering now comprises devices, apps, online interface portals, and data management and analytics cloud. We think this creates a potential competitive advantage based on a bundled data offering.

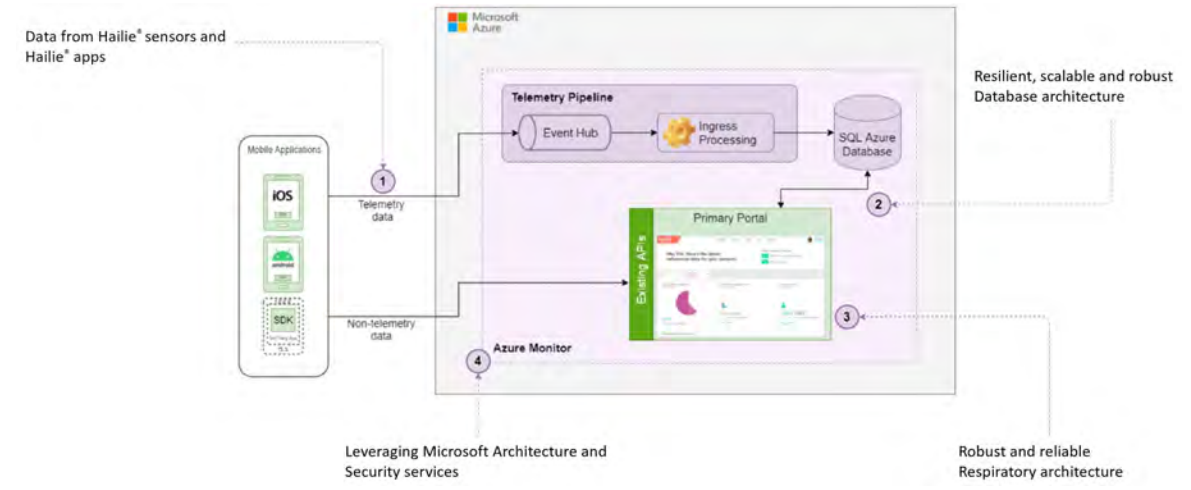
A consolidated digital solution for respiratory management also expands Adherium's market scope and supports engaging with a variety of B2B2C customer segments including remote patient management providers, traditional healthcare providers and health insurers seeking to improve clinical outcomes and lower healthcare costs.

There are three key elements to the Hailie® platform:

- Hailie® architecture, which is the backbone of the entire platform
- Hailie® SDK (Software Development Kit), which provides a library of tools to facilitate the third-party development of Hailie®-compatible apps and software
- Hailie® API (Application Programming Interface), which effectively acts as a 'messenger' between Hailie® software and third-party software so that they can be integrated and so that the third-party data can feed into the Hailie® cloud.

The 'skeleton': Hailie® architecture: The latest platform architecture of the Hailie® solution and platform has expanded Adherium's commercial prospects by enabling integration services, as well as provisioning a scalable global platform. The revamped platform extends the capability of data analytics, interoperability and improves the value proposition to multiple user groups. The Hailie® platform is based on Microsoft Azure and hosted in the US and Australia.

Exhibit 11 – Hailie® architecture – the backbone of the entire platform



Source: Adherium.

The 'building kit': the Hailie® Software Development Kit (SDK) is one of two primary paths for the integration of Hailie® sensor data into a customer/partner's ecosystem or third-party application. The Hailie® SDK includes documentation, code samples, libraries, and processes, as well as guides that developers can use and integrate into their apps. Developers can use SDKs to build and maintain Hailie®-compatible applications without having to write everything from scratch. In addition to supporting the use of Hailie® sensor data to be displayed on third-party applications, the SDK facilitates the flow of Hailie® sensor data through to both the Hailie® cloud and third-party cloud. Notably, under the Health Insurance Portability and Accountability Act (HIPAA), Adherium must maintain a copy of all data provided to third-party customers.

The 'translator': the Hailie® Application Programming Interface (API) is the second primary path for the integration of Hailie® sensor data into a customer/partner's ecosystem or third-party application. The Hailie® API is a set of programming instructions and standards for accessing a web-based software application or service.

The Hailie® API gives developers instructions about how to interact with services and can be used to connect data between different systems. APIs generally act as mediators between the users or clients and the resources or web services they want to get. They also allow organisations to share resources and information while maintaining security, control, and authentication—determining who can access what.

The Hailie® API is an example of a REST API, which is a popular standard among developers given its use of industry-standard HTTP commands. The Hailie® API is a key element of the platform and allows seamless connection with multiple sources of information/data. This should support partnering with a broad range of potentially synergistic devices and information sites: for example, integration of real-time weather reports to inform patients of air quality.

Exhibit 12 – Hailie® API – the 'messenger' between Hailie® and third-party software

Source: MST Access.

Hailie® Ecosystem – A Single Source Solution for Multiple Customer Segments

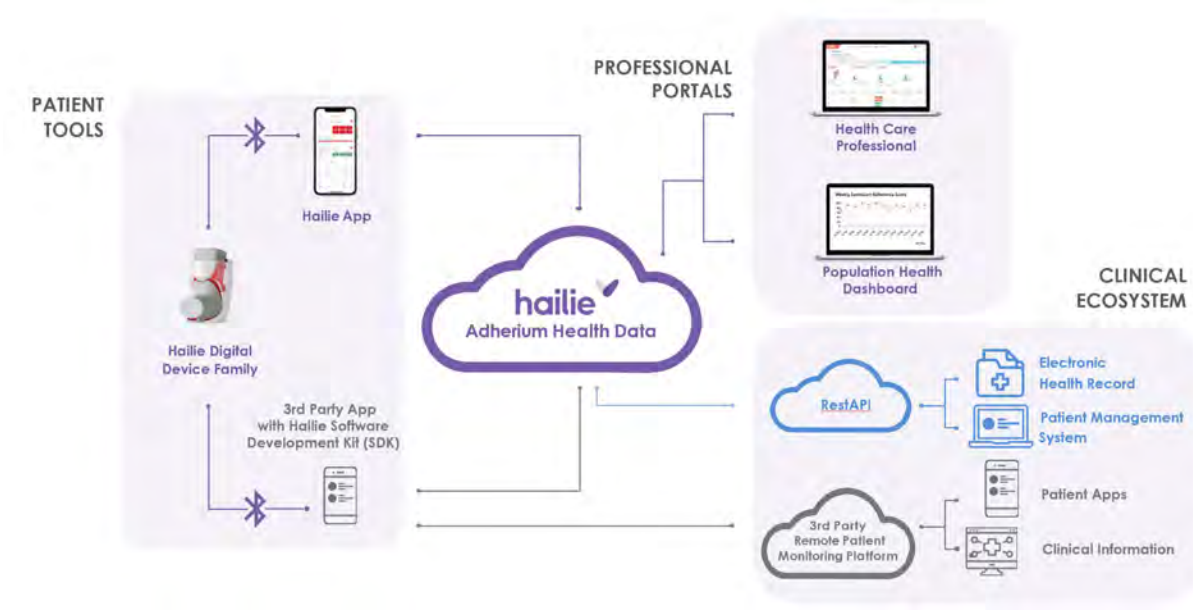
A flexible and highly scalable platform that supports multiple B2B2C channels

From a platform perspective, the Hailie® ecosystem is highly flexible and provides a single solution to a variety of stakeholders involved in the delivery of healthcare services to these high-risk patient populations. These include healthcare professionals (physicians), payors, hospitals, and third parties seeking a white label–outsourced solution for their platform.

Exhibit 13 highlights the key elements of the platform:

- Hailie® device
- Hailie® app
- Hailie® data cloud
- online interfacing portals (healthcare professional interface and payor interface)
- interface with third-party apps developed with Hailie® SDK
- Rest API to interface with multiple sources of data, including third-party devices such as peak flow meters and spirometers, electronic health records and patient management systems.

Exhibit 13 – Hailie® ecosystem – a flexible channel partner platform



Source: Adherium.

Telehealth Moves to the Front Line and Redefines the Virtual Care Model: Adherium Poised to Benefit from Current Surge in Remote Patient Monitoring

Adherium's development of a single-source digital solution comes at an opportune time given the global impact of COVID-19, and the surge in demand for virtual healthcare in the US, which has accelerated the adoption of remote patient monitoring (RPM) programs and telehealth more broadly[6]. Although research supporting the clinical benefits of RPM has been available for well over a decade[7], reimbursement to providers was only introduced in 2019. That said, we see reimbursement and the move towards value-based care payment models in the US as positive for the adoption of RPM, given the high cost of hospitalisation, and expect this trend to persist beyond the end of the pandemic.

New Remote Therapeutic Monitoring codes provide tailwind for Adherium in the US

In November 2021, the Centers for Medicare and Medicaid Services (CMS) finalised the new Remote Therapeutic Monitoring codes, effective 1 January 2022, which complement the Remote Physiological Monitoring codes released in 2019. Collectively, the codes represent a significant improvement in reimbursement for providers of telehealth services in the US whereby physicians will be directly financially incentivised to adopt RPM, and positive for adoption of the Adherium's Hailie® solution.

The American Medical Association maintains and develops the Current Procedural Terminology (CPT) code set. CPT[8] codes are descriptive terms used in reporting medical, surgical, and diagnostic procedures and services that are performed by physicians and other qualified healthcare professionals in the US.

CPT codes form the basis for reimbursement, research, and tracking medical utilisation[9]. These codes have existed for numerous remote medical services for some time; however, codes to describe general remote monitoring of physiological data were only introduced in 2018. In 2020, in response to COVID-19, the CMS broadened access to Medicare telehealth services so that beneficiaries could receive a wider range of services from their doctors without having to travel to a healthcare facility. In November 2021, the CMS introduced five new CPT codes for devices allowing for prescribed payments relating to set up, supply and monitoring of devices for Remote Therapeutic Monitoring.

Remote Physiological Monitoring codes – introduced in 2019

RPM codes cover the collection and analysis of patient physiological data that are used to develop and manage a treatment plan related to a chronic and/or acute health illness or condition. RPM codes reimburse providers for the review of physiological data (e.g., weight, blood pressure, pulse oximetry, respiratory flow rates, blood sugar).

Exhibit 14 – Remote Physiological Monitoring codes (introduced in 2019)

CPT Code	Descriptor	Value USD
99453	Initial Set-up and Patient Education	19.03
99454	Device Supply for Monitoring Physiologic Parameters (with daily recordings or programmed alert transmissions)	55.72
99457	Monitoring/Treatment Management Services. First 20 minutes	50.18
99458	Monitoring/Treatment Management Services. Each additional 20 minutes	40.84

Source: CMS.

[6] The number of Medicare fee-for-service (FFS) beneficiary telehealth visits increased 63-fold in 2020, from approximately 840,000 in 2019 to nearly 52.7m in 2020.

[7] https://pubmed.ncbi.nlm.nih.gov/16330791

[8] CPT is the most widely used medical code set across the US. The CPT code set is not only used by clinicians for reporting purposes, but also by administrative personnel for claims processing and developing guidelines for medical care review

[9] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7954815/

Remote Therapeutic Monitoring codes – added in January 2022

The new RTM codes were created by the CPT Editorial Panel in October 2020 and finalised by the CMS in November 2021. These codes, specifically for respiratory and musculoskeletal indications, expand Medicare reimbursement for RPM specific to therapeutic areas and can include non-physiological measures. These codes also expand the classification of providers to include physical therapists, occupational therapists, speech language pathologists, clinical psychologists, and other practitioners than those currently permitted to bill RPM under a doctor's physical presence and observation. The new codes cover three practice expense (PE)–only codes and two codes that include professional work (see Exhibit 15).

RTM codes support the collection of non-physiological data with focus on adherence, therapy, and response. These codes include initial set up and provisional training to patients on how to use the medical device; regular monthly health data and alert transmissions; and the development of treatment plans.

Exhibit 15 – Remote Therapeutic Monitoring codes

CPT Code	Descriptor	Value USD
98975	Initial Set-up and Patient Education	19.38
98976	Device Supply for Monitoring Respiratory System (with daily recordings or programmed alert transmissions)	55.72
98980	Monitoring/Treatment Management Services. First 20 minutes	50.18
98981	Monitoring/Treatment Management Services. Each additional 20 minutes	40.84

Source: www.foley.com/en/insights/publications/2021/11/2022-remote-therapeutic-monitoring-cms-final-rule.

Value-based care payment models and optimisation of chronic disease management

Value-based care is a type of payment model that pays doctors and hospitals for treating patients, at the appropriate time, with an appropriate level of care. The value-based payment model aims to allow purchasers of health care (government, employers, and consumers) and public and private payers to hold providers of healthcare (such as physicians, other providers, and hospitals) accountable for both the quality and cost of care.

Put simply, under value-based care healthcare, providers are rewarded on health outcomes for dollars spent and not the volume or number of healthcare services they provide. This represents a shift from the traditional fee-for service model, which is driven by volume, to value-based care, which focuses on health outcomes.

This process rewards optimisation of disease management to avoid the patient requiring avoidable higher-cost medical treatment and was largely brought about by changes introduced through the Affordable Care Act in 2010. These included Medicare and Medicaid penalties for health care–acquired conditions (not limited to hospital acquired) and penalties for excessive preventable Medicare readmissions.

Remote patient monitoring reduces acute episodes and avoidable hospital admissions

Notably, Adherium is focusing on patient populations where adherence matters most: the 8.5m severe/difficult-to-treat asthma and late-stage COPD patients out of the approximately 51m people with asthma or COPD in the US. This patient population has the highest burden of care and cost to the healthcare systems and is prone to readmission within 30 days of treatment, adding a further financial burden because of penalties levied by payers on the physicians.

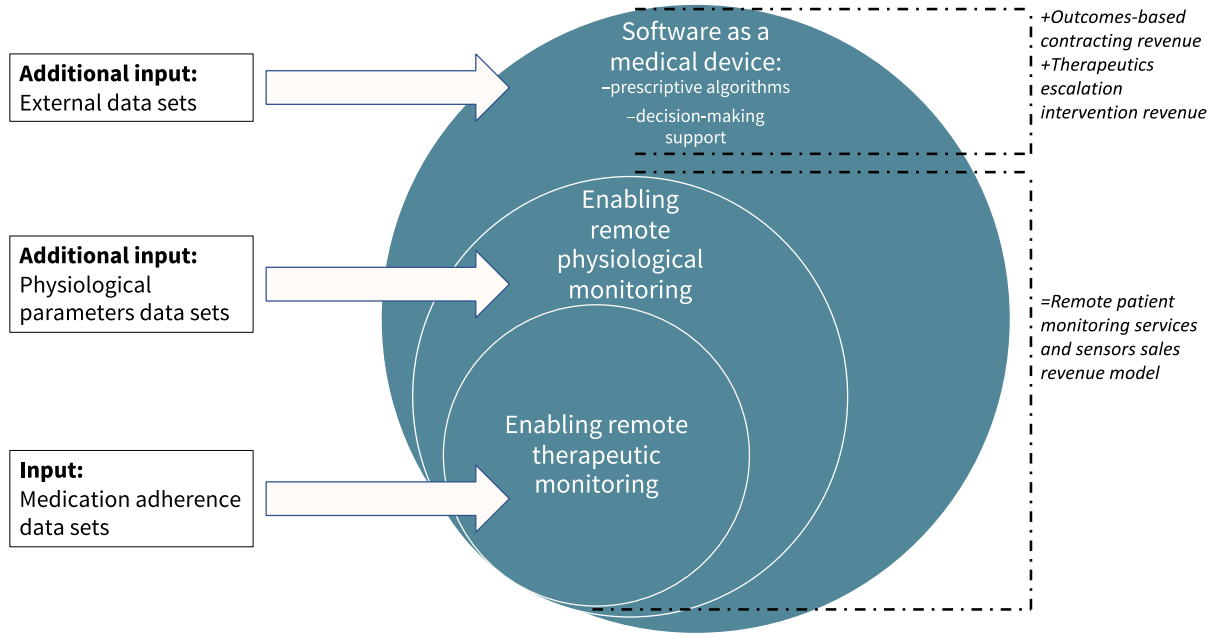
Future Opportunities in the Cloud: Unlocking the Value of Big Data Analytics

The value of advanced big data analytics in the management of chronic conditions stems from the potential to learn from the treatment history of patients. As such, the integration of multiple clinical and environmental data sources on the Hailie® platform and storage of that data in the cloud over time creates a growing, increasingly valuable strategic resource for use in supporting predictive modelling of therapeutic strategies and optimising patient management.

Using artificial intelligence and machine learning models to power big data analytics and causal inference has the potential to optimise these strategies in patient management and move from preventive to predictive maintenance. Gaining insights into exacerbation triggers is especially relevant in management of patients with respiratory conditions such as difficult-to-treat asthma and COPD.

We think Adherium is well positioned to lean into this emerging trend towards data-science enabled insights gleaned from real-time ongoing data, given its breadth of patented sensors, proprietary algorithms, and interoperability of its drug agnostic cloud-based platform. We see the value of its data set growing rapidly subject to adding scale given the company's stated strategy of targeting managers of medium to large patient populations.

Exhibit 16 – Big data analytics + the even 'bigger picture' of data science–enabled insights for preventative care



Source: MST Access.

Market Overview: Surges in Adoption of Digital Health, Remote Patient Monitoring Set Up Opportunities for Adherium

Digital health (also called eHealth) is an umbrella term for all healthcare-related applications, technologies and delivery systems that have been fundamentally reimagined to take advantage of the connectivity made possible by the internet. Put simply, digital health encompasses the use of digital tools and interventions to support improvements in patients' wellness and healthcare. In this context, Adherium's focus on developing a suite of products with third-party interoperability, as well as a powerful data set that can be leveraged across a range of clients to create new revenue opportunities, makes good strategic sense.

Understanding Digital Health

Digital health helps companies, healthcare professionals, and patients

For companies: Digital health can increase healthcare delivery efficiencies to meet the challenges associated with an ageing population and the associated increases in incidence/prevalence of acute/chronic diseases in a world of limited healthcare resources, including a shortage of healthcare professionals.

For healthcare professionals: A raft of innovative, and increasingly virtual and connected, models of healthcare delivery have emerged, redefining clinical care of patients from hospital and physicians' offices through to home care settings and giving rise to telemedicine. Benefits include better information sharing between different sources of care and reduced duplication of medical testing, lowering costs of delivery and providing access to medical services in rural areas. This has led to strong support from payors globally.

For patients: Advances in sensor technology, medical algorithms, and an explosion of consumer technologies (smartphones, wearables) coupled with cloud-based data monitoring and storage has generated many clinical and non-clinical digital health applications. Real-time data allows consumers to self-monitor and play a more active role in their own health and wellbeing.

The four segments of digital health

The digital health market consists of four often overlapping segments.

1. Electronic health record (EHR) and electronic medical record (EMR) systems comprise systematic collections of patient and population health information stored electronically in a digital format.

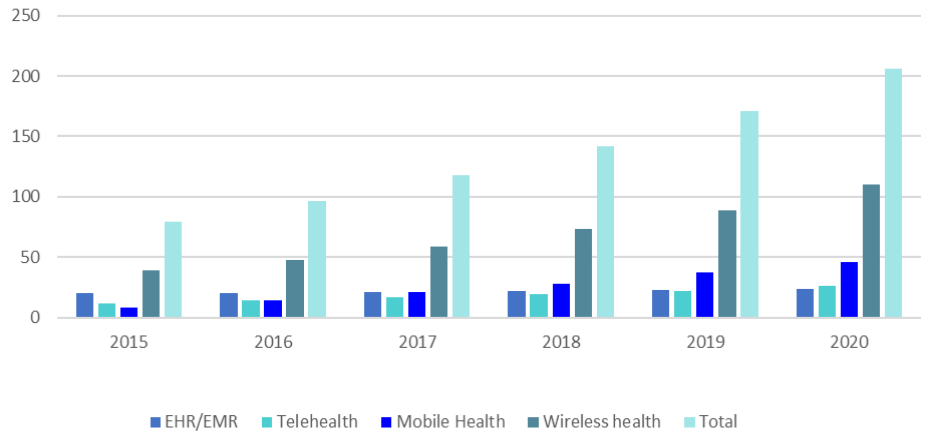
- An EHR is a longitudinal series of electronic health information for individual patients or populations.
- An EMR is a patient record created by providers following a specific medical event and is typically used by providers for diagnosis and treatment. An EMR can serve as a data source for an EHR.

2. Telehealth. While the terms 'telemedicine' and 'telehealth' are sometimes used interchangeably, telemedicine is typically a physician-focused term, while telehealth is used to refer to all services provided by healthcare professionals and includes preventive health support and medical education. Both relate to the treatment of various medical conditions without seeing the patient in person, through the remote exchange of data between patients at home and their clinician(s) including videoconferencing, or through fixed or mobile home units using phone lines or wireless technology to assist in diagnosis and monitoring.

3. Mobile health (mHealth) is a broad term referring to a practice of medicine and public health supported by mobile devices, such as mobile phones, tablets, personal digital assistants coupled with wireless infrastructure, clinical-grade wearables, mobile telemedicine/telecare devices, mobile operating system technology and mobile applications, and apps. As such, it can be considered a subset of telehealth.

4. Wireless health involves the integration of wireless technology into traditional medicine, such as diagnosis, monitoring and treatment of illness, and other tools that provide real-time monitoring of patients at home, at work or at conventional point-of-care settings. Wireless health differs from mHealth in that wireless health solutions will not always be mobile and mobile health solutions will not always be wirelessly enabled. For example, glucose-sensing technologies that can detect potentially dangerous glucose levels are a type of wireless health technology that do not necessarily have a mobile health component.

Exhibit 17 – Global digital health market by major segment (2015–2020, US$ bn)



Source: Statista.

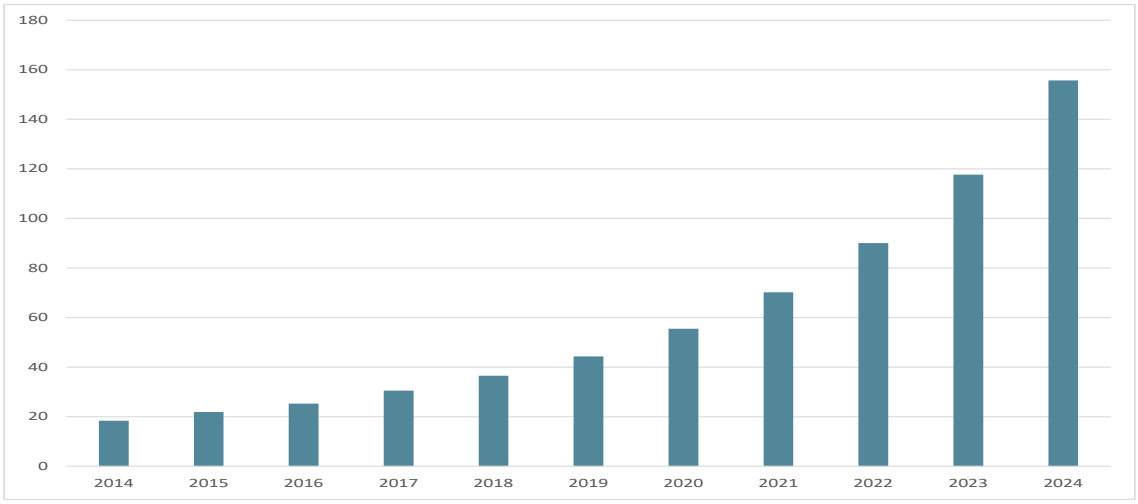
Digital health skyrockets in 2020; set to continue as populations age, technologies evolve

Statista estimates the 5-year CAGR of the total global digital health market to 2020 was ~21%. This reflects underlying CAGRs of 42% in mobile health, 23% in wireless health, 17% in telehealth, and 4% in EHR/EMR.

The trend towards self-directed fitness and investment in personal wellness by consumers has contributed to growth in mHealth, while telehealth has taken off as healthcare professionals increasingly connect with patients via wireless technologies. This has spurred significant capital investment into mHealth and telehealth, as shown by the success of IPOs (Fitbit, Teladoc, Invitae, MindBody, Evolent Health) and the growth of established telehealth names (American Well, MDLIVE, Doctor on Demand, HealthTap).

Pre–COVID-19, Research and Markets estimated the global digital health market would reach ~US$500 bn by 2025 (5-year CAGR: ~23%), citing an ageing population as the major driver, with people over 60 expected to double to around 2.5 bn by 2050 as a result of extended life expectancy in emerging economies. In the US, Statista expects the digital health market to reach ~US$156 bn by 2024 (5-year CAGR: 20%) due to the increasing prevalence of chronic diseases with an ageing population, continuing integration/convergence of current technologies, new digital health entrants and more supportive regulatory/reimbursement initiatives. However, we think this could be an underestimate given the impact of the COVID-19 pandemic on telehealth and remote patient monitoring to date.

Exhibit 18 – United States digital health market size forecast (2014–2024, US$ bn)



Source: Statista. 2014–2020 are reported numbers. 2021–2024 are estimated numbers.

Digital health drivers converge: COVID-19, WHO guidelines, health trends

Going virtual – telehealth the 'new normal' in a post–COVID-19 world. Digital technology has facilitated connection during COVID-19 and provided tools for providers to roll out triage models of virtual care, highlighting the need for remote patient monitoring and accelerating the move to virtual health platforms. We think momentum in the adoption of digital health has increased and will level off higher. The 'new normal' will inevitably have a digital health ecosystem at its core, given the potential to reduce costs and expand care provision. Over the past decade, healthcare organisations globally have been digitising operations and processes and building IT infrastructure to enable interoperability of devices and exchange of data. The groundwork has been laid for a digital backbone in healthcare, and the prospect of seamless integration between information from multiple sources of medical devices and electronic health records – the 'Internet of Things' (IoT) in healthcare – now seems within reach.

World Health Organization (WHO) guidelines to set standard for digital health implementations. The WHO set up its first Digital Health Department in 2019, setting the stage for a globally coordinated step change in implementing digital interventions across healthcare systems. Aimed primarily at public health providers, the department will provide evidence-based guidance to incorporate and maximise the benefits of existing and emerging digital/mobile technologies to support health system needs. It will develop a framework (and much-needed proxy for standards) for digital health globally for a diverse set of stakeholders (governments, clinicians, network operators, researchers). The guidelines should improve alignment across digital health implementations and accelerate global adoption to drive demand at an enterprise level.

Partnerships and collaborations informing new products and services. Professional groups and industry-wide collaborations are emerging to help grow healthcare innovation. An increasing number of partnerships with professional end users are informing new product development of evidence-based products and services and building confidence in the practice of digital medicine.

Digital health trends are changing our approach to health. Digital health technology is impacting adjacent areas of health, giving rise to new product and application opportunities for innovators. Trends include technologies led by **patients** (preventing disease via increased focus on fitness and wellbeing; using mobile apps/devices to help manage medical conditions); **employers** (technology-enabled health/wellness programs to lower healthcare costs); **healthcare providers** (AI for early diagnostics incorporated into medical devices; personalised mental healthcare; 3D prosthetics printing); and **enterprises** (virtual clinical trials using mobile tools to track endpoints and share data with research teams).

Understanding mHealth

Fastest-growing digital health segment; more upside ahead

Mobile health (mHealth) is a term encompassing the use of health-related mobile applications, mobile, and wearable devices to support the practice of medicine and public health. The WHO defines mHealth as medical and public health practice supported by mobile devices and states the key objective of using mHealth is to increase access to health services through the effective and timely sharing of health data. Put simply, mHealth refers to the use of mobile tools and data generated, stored, or transmitted to monitor health status by consumers and inform or support clinical decision-making and patient management strategies by physicians.

The four categories of mHealth

Healthcare apps for smartphones/mobile devices	Software programs used in health promotion and disease prevention, diagnosis, treatment, monitoring, and the provision of support for health services, both for overall wellness and for specific diseases. Their potential clinical utility is strengthened by the FDA's focus on mobile medical apps that can be defined as a medical device or an accessory to a regulated medical device.
Mobile care tools	Smartphone device attachments and accessories that monitor health and provide more specialised analysis compared with wellness-focused wearables (e.g., Fitbit). Sensors take readings of health parameters (e.g., blood pressure, electrocardiogram monitors) and display them through the smartphone.

Wearables	Devices worn on the body for patient monitoring: consumer-facing technologies (eg Fitbit) which generally do not need FDA approval; medical-grade wearables for real-time remote patient monitoring of critical conditions (eg cardiac monitors) which need approval. Integrated sensors transmit real-time data via Bluetooth to a mobile device, which sends the data to a web portal for analysis.
Healthcare enterprise smartphone-based portable systems	Healthcare-specific, sensor-equipped devices used as diagnostic tools in clinical settings: specialised mobile versions of large equipment (eg ultrasound scanners) and devices which work with smartphones to send data to physicians (eg blood sugar monitors).

Strong mHealth growth over past decade, but unresolved issues holding sector back

mHealth has attracted significant capital investment over the past decade and delivered explosive growth, driven largely by the raft of consumer health– and wellness-related apps and devices launched in recent years, such as Fitbit and MyFitnessPal. According to Statista, the multi-billion-dollar global mHealth market saw a very high 5-year CAGR of 42% to 2020, with wellness or lifestyle apps accounting for ~ 66%.

Notwithstanding the wave of consumer-facing healthcare apps reaching the market, mHealth is still considered an emerging sub-segment of digital health in clinical settings. The proliferation of consumer wearables and apps on the market not requiring FDA approval, such as Fitbit and MyFitnessPal, suggests there is a latent need and demand by patients for self-management of health and wellbeing.

However, several factors have led clinicians to be slow to adopt mHealth tools in general practice:

- a lack of reimbursement; insufficient financial incentives to justify perceived disruption of their practice
- technical issues relating to network reliability and speed
- relationship concerns: a loss of personal patient-physician connection; privacy/confidentiality issues
- not enough solid evidence-based outcomes demonstrating clinical effectiveness
- clinician and organisational resistance to adopting new practices.

With advances in sensor technology, algorithm design, use of big data analytics, cloud computing, and increased FDA scrutiny, mHealth products have been addressing these issues incrementally and expanding the utility of mHealth tools and services. However, clinicians have been slow to buy in – until now.

COVID drives telehealth surge, moves mHealth adoption in primary care to warp speed

COVID-19 delivered an unprecedented catalyst for mHealth adoption, supported by government policy, and through necessity has significantly accelerated a trend towards virtual care that was already underway. The broadening of Medicare coverage and payment of virtual services in the US in particular has removed the biggest barrier to adoption – cost – and catapulted mHealth into the spotlight by putting telemedicine on the same footing as in-office visits to primary care physicians.[10]

Reimbursement changes due to COVID elevate telehealth and mHealth to the front line

US. In March 2020, the CMS broadened access to Medicare telehealth services so beneficiaries can receive a wider range of services from their doctors without having to travel to a healthcare facility. The expanded access is for the duration of the COVID-19 pandemic, and matched pre-existing parity laws in 29 US states which already required private payers to reimburse telemedicine in the same way as in-person care.

The changes to CMS' Medicare telehealth reimbursement policy have enabled Medicare Advantage plans to better engage their beneficiaries and addressed a major barrier to senior telehealth adoption, paving the way for new possibilities and models of care delivery.

Notably, according to the US Department of Health and Human Services, the number of Medicare fee-for-service (FFS) beneficiary telehealth visits increased 63-fold in 2020, from approximately 840,000 in 2019 to nearly 52.7m in 2020.

Australia. In March 2020, telehealth-related bulk-billing items were introduced in Australia on the Medicare Benefits Schedule (MBS) in response to COVID-19. The MBS telehealth items are available to GPs, medical

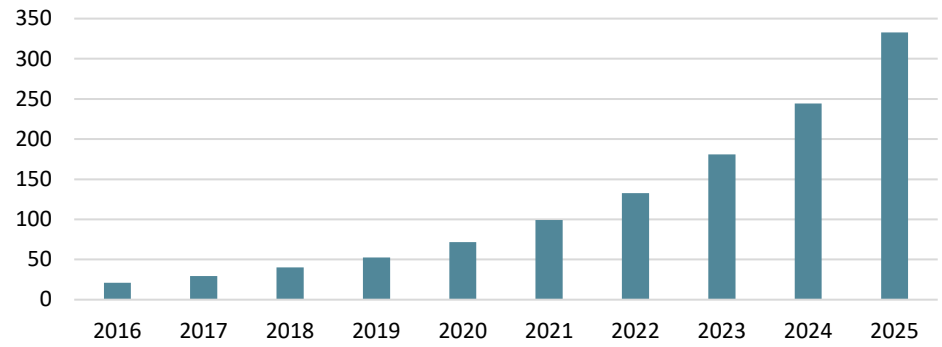
[10] https://www.cms.gov/newsroom/fact-sheets/medicare-telemedicine-health-care-provider-fact-sheet

practitioners, nurse practitioners, participating midwives, allied health providers and dental practitioners in the practice of oral and maxillofacial surgery. These bulk-billing incentive Medicare fees are (currently in place as of August 2022) for items relating to GP and Other Medical Practitioner (OMP) services, diagnostic imaging services and pathology services.

mHealth market drivers beyond COVID: from smartphones to smart systems

The evolution of mHealth has been rapid and largely consumer-driven, changing with every iteration of the smartphone and adjacent mobile platforms. However, COVID-19 has brought mHealth and telemedicine into mainstream traditional healthcare settings in a more clinically meaningful way, a trend we expect will continue. Prior to COVID-19, Statista estimated the global mHealth market would reach ~US$244 bn by 2024 (5-year CAGR: ~36%). Growing acceptance of mHealth in 2020 led to the establishment of digital health formularies by several of the US's largest pharmacy benefit managers (PBMs). Like traditional prescription drug formularies, PBMs can select products and negotiate prices to create digital health formularies, which are updated as new apps become available and replace older tools or as prices are renegotiated.

Exhibit 19 – Total mHealth market size forecast worldwide (2016–2025E, US$ bn)



Source: Statista. 2016–2020 are reported numbers. 2021–2025 are estimated numbers.

It is too soon to say how mHealth will shape traditional healthcare models globally to cope with ageing populations, pervasive chronic disease, and healthcare worker shortages. However, near term and given COVID-19, we expect virtual visits and remote patient monitoring to remain the key drivers of telehealth market growth. We think new hybrid models of healthcare will be influenced by developments in several areas:

Regulatory drivers

- Increasing clinical evidence-based validation based on measurable and accurate data
- Increased transparency with respect to the medical utility of medical mobile apps
- Oversight and guidance tailored to the fast-moving digital health industry, brought in by the FDA's Digital Health Innovation Action Plan under the 21st Century Cures Act, which aims to encourage innovation, add evidence-based rigour, build confidence in mHealth applications' reliability and value
- FDA Breakthrough Devices Program, a designation pathway to foster innovation and new applications

Technology drivers

- Smartphone and adjacent device functionality
- Advances in sensor technology
- Real-time data transfer to health IT systems and improved interoperability
- Speed and security of internet connectivity, cybersecurity, and cloud capacity (5G network)
- Use of AI, machine learning, virtual reality and robotics that expand the telehealth model
- Convergence of advanced technology, software innovation and data analytics

Health economics drivers

- New efficiencies in healthcare delivery driven by increased patient engagement and compliance
- Expanded access and extended reach to remote communities
- Low cost/affordable telemedicine for developing countries

- Chronic disease management (cardiovascular disease, diabetes, blood pressure, asthma)
- Penalising excess hospital readmissions
- Value-based reimbursement models

Innovation drivers – novel mHealth medical interventions/platforms

- Increasing clinical validation of mHealth to drive novel bundling of mHealth platforms with wireless sensors, digital therapeutic tools, and virtual reality
- One example: the FDA-approved EndeavorRx, a connected health treatment (made available by prescription) that uses video game technology to address attention function in children with ADHD

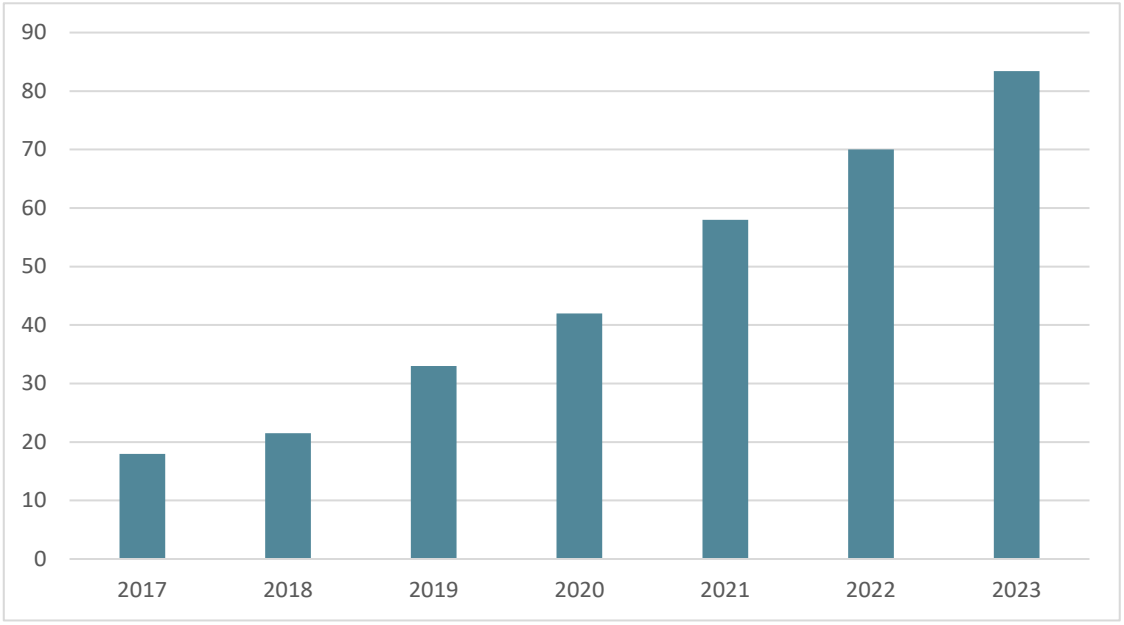
Remote Patient Monitoring Opportunity – mHealth an Ideal Solution

Patients with chronic conditions, such as the 8.5m severe/'difficult-to-treat' asthma and late-stage COPD patients on which Adherium is focused in the US, account for the substantial majority of hospital admissions as well as continuing growth in unplanned emergency department (ED) visits, and are highly vulnerable to COVID-19, even when vaccinated. This patient population is typically prone to hospital readmission with 30 days of treatment and consequently represents a significant burden of care and cost to healthcare systems which are now particularly strained by increasing patient numbers and social distancing rules due to COVID. Paradoxically, adherence (and thus monitoring) matters most for these patient populations. mHealth technologies, which provide continuous patient monitoring and communication outside of conventional clinical settings, are ideally suited to address these capacity challenges.

As a result, remote patient monitoring (RPM) is expected to continue to grow. Berg Insight estimates ~83.4m RPM patients by end-2023 (vs 2017: 16.5m), generating revenues of EUR 46.1 bn (2017: EUR 13.9 bn) (see Exhibit 20). It estimates mHealth connectivity solutions, care delivery platforms and mHealth care programs will account for 59% of total RPM revenues in 2023 (~EUR 27 bn), up from 32% in 2017 (~EUR 4.5 bn).

Further incentives to adopt RPM in the US include the Medicare value-based Hospital Readmissions Reduction Program (HRRP) introduced in 2012. This purchasing program lowers payments to participating hospitals with excess readmissions. It penalises hospitals for unplanned readmissions within 30 days, with a focus on heart failure/attacks, pneumonia, COPD, coronary artery bypass graft, hip surgery, and knee surgery.

Exhibit 20 – Remote patient monitoring devices, worldwide (2017–2023, million units)



Source: Berg Insight.

Competitive Landscape – Highly Fragmented and Still Nascent

Adherium operates in a relatively new but rapidly growing section of the digital health market. The extreme pressure on healthcare systems globally due to the COVID-19 pandemic provided an unprecedented impetus to trial virtual healthcare models, such as remote patient monitoring (RPM), to compensate for reduced face-to-face visits. Notably, RPM had been gaining ground pre COVID-19 in several disease areas, such as heart disease, mental health, lung disease, and diabetes.

Introduction of reimbursements by the US Centers for Medicare & Medicaid Services (CMS) in 2019, combined with consolidation activity in the sector, most notably the acquisition of Livongo by Teladoc in October 2020 for US$18.5b to form Teladoc Health (NYSE: TDOC), suggest a more permanent role for virtual care models. Competition in the telehealth space for example has been increasing recently with Amazon moving into virtual care clinics for its employees and Walmart acquiring multispecialty telehealth provider MeMD. At this stage, the competitive landscape in Adherium's target respiratory focused RPM market remains highly fragmented with no clear dominant player.

Others provide inhaler e-monitoring, but Adherium has the broadest device coverage

Development of the Hailie® platform incorporating the proprietary Hailie® sensors at the front end redefines the company's value proposition and range of competitors. Adherium as a single source solution provider in respiratory management competes on two fronts: device and SaaS platform.

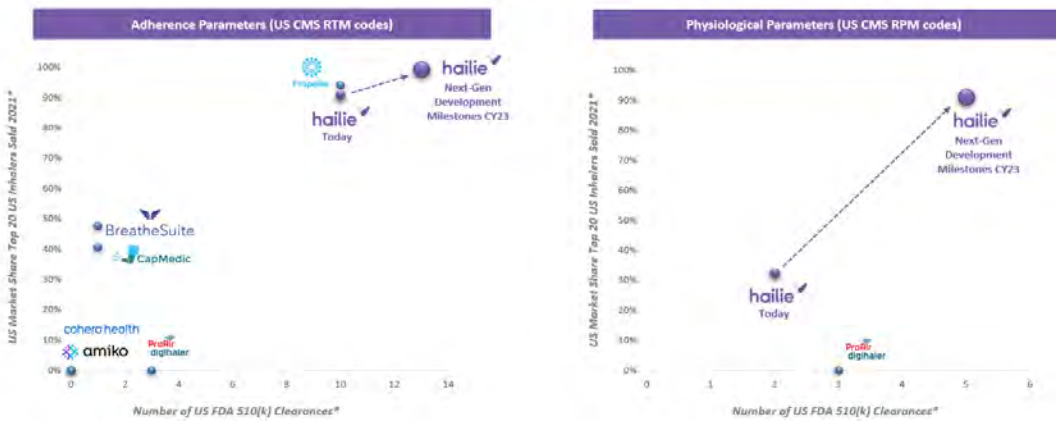
From a device perspective, several digital health companies in the inhaler e-monitoring space have partnered with pharmaceutical companies. Major companies active on the device front include: Teva Pharmaceutical, AstraZeneca, GlaxoSmithKline plc, AptarGroup Inc, Novartis AG, OPKO Health Inc, BreatheSuite Inc, Propeller Health, H&T Presspart Manufacturing Ltd, and Zeolr Technologies Pvt Ltd.

Nonetheless, Adherium is well differentiated with the broadest range of inhaler presentations (rescuer/reliever and preventer) covered incorporating physiological and therapeutic parameters that qualify under the expanded CMS reimbursement framework.

Management has been successful over the last 12 months in expanding the number of FDA approvals for inhaled medication sensors capturing both adherence and physiological parameters, increasing coverage to 91% of the top 20 US branded medications, up from 71% in 2021. The latest was the FDA 510 (k) clearance in July 2022 to market connecting GlaxoSmithKline's (GSK) Ellipta® inhaler users with the Hailie® sensor with physiological parameters for monitoring asthma and COPD medication use.

In our opinion, direct competition to the company's integrated cloud-based platform offering in respiratory management is relatively nascent at this point, given the highly fragmented competitive landscape comprising point solutions that lack scale. We expect the value of data accumulated subject to scale achieved will add to Adherium's differentiated offering and enhance its competitive position longer term.

Exhibit 21 – Adherium's growing RTM + RPM coverage in the market: CY23 FDA 510(k) vs top 20 US inhalers



Source: Adherium. * US Market Share from IQVIA 2022 dataset based on the Top 20 US inhaler unit volume sold in the US market in 2021. RPM coverage only considers digital inhalers that incorporate physiological measures in the core digital inhaler sensor without additional attachments. ProAir medications FDA NDA.

Intellectual Property – 180 Patents & Designs in Place Globally

Adherium's intellectual property comprises a large body of confidential information and technical know-how captured within the organisation. The various components of its platform were developed in-house over many years and would not be easily replicable outside of the company. These components include:

- technical know-how: device, design, and engineering
- software source code
- database schema (including the cloud and app)
- data analytics algorithms that will allow the company to monetise its data cloud as it captures more information about disease management over time.

In terms of registered intellectual property, the company has several trademarks in key markets, as well as registered design families for the add-on designs for DPI and pMDI devices. Adherium has amassed a strong portfolio of patents globally covering all major jurisdictions of the US, Europe, China, Australia/NZ, and Japan.

On a combined basis, Adherium has a total of 180 granted patents and registered designs globally.

Exhibit 22 – Adherium intellectual property and global patent protection

Jurisdiction	Type	Number
USA	Registered designs	4
USA	Granted utility patents	8
United Kingdom/Europe	Registered designs	73
United Kingdom/Europe	Granted utility patents	4
China	Registered designs	25
China	Granted utility patents	4
Japan	Registered designs	10
Japan	Granted utility patents	1
Australia	Registered designs	22
Australia	Granted utility patents	2
New Zealand	Registered designs	23
New Zealand	Granted utility patents	4
	Total	**180**

Source: Adherium.

Financial – Sticky SaaS Platform with Multiple Revenue Streams

Adherium's financial history has been marked by volatility reflecting several shifts in commercial strategy since listing in 2015. These have included a period of direct-to-consumer sales of its devices into the US market and a long association with commercialisation partner Astra Zeneca.

We see the company's new single source solution integrating both its flexible SaaS platform architecture, and growing portfolio of 510 (k) cleared devices for remote patient monitoring, as core to its competitive strategy and underpinning a variety of B2B2C opportunities in the management of asthma and COPD.

Economies of Scale to Drive Cost Efficiencies and Network Effect to Increase Switching Costs

Offering a single source solution creates a connected platform with the potential for strong network effects that increase consumers' switching costs. As such, we see the company's pathway to revenue generation expanding over time as accumulation of patient data enhances the clinical utility of the product suite in patient management and expands the value proposition to end users of data.

Management has guided to a staged growth strategy over the next 3 years initially targeting multi-year deals with medium sized partners servicing patient populations of around 50,000 patients (small hospital chains, medical groups, RPM companies). As it executes on these it plans to move to larger groups and expand into health benefit payor groups with value-based incremental pricing services. At scale, and by fiscal 2026, management expects mining of patient data will strengthen the predictive benefits of the platform and support a premium based on preventative interventions.

Revenue Model:
Pathway to Revenue Based on Connected and Complementary Services

Consistent with its multi-channel growth strategy, Adherium's diversified revenue model consists of the following future revenue streams.

- **Device sales** – Sales of Hailie sensors will be the fundamental first step for most contracts, but pricing could vary according to group purchasing and volume considerations.
- **Subscription (SaaS)** – The core stream in the new revenue model will be revenue generated by subscription to the platform and its data analytics capabilities. The subscription model will offer customers the opportunity to purchase services on a fixed-costs basis. This would most likely appeal to managers of large populations and help streamline budgeting to match timing of reimbursements.
- **Data fees** – As the platform becomes ubiquitous, we see the opportunity to sell data to third parties for integration into their platforms and service offerings.
- **Clinical trial services** – Revenue from remote patient monitoring programs deployed in clinical trials already gaining traction with wearable technologies should accelerate as platforms and devices prove their clinical utility and gain acceptance in the respiratory space.
- **Value-based contracting** – Increasing adherence should reduce unexpected exacerbations and lower healthcare costs. As such, Adherium will pursue opportunities to partner with US health benefit payors through value-based contracts, in which insurers are financially incentivised to lower costs of care and improve patient outcomes.
- Data science – Ultimately a rich data set demonstrating clinical utility of the offering in predicting impending exacerbations of respiratory events would open the door to preventative applications of the software.

Valuation

We value Adherium at A$114m, or $0.03 per share, using DCF methodology on free cash flow. This assumes the company will raise A$15m in FY23 by issuing an additional 1.5b shares at the current share price of $0.01. Key DCF inputs are beta of 1.20, WACC of 12.5% and terminal growth rate of 2% (see Exhibit 23). We think DCF methodology allows for more granular modelling of accumulated tax losses and best captures the cash flow generation potential of the business over time.

Exhibit 23 – Base-case DCF valuation and key inputs

	2022	2023	2024	2025	2026
EBIT	-10,895,250	-9,993,903	-3,418,520	8,164,888	13,017,270
Tax at standard rate	0%	0%	0%	0%	0%
Post-tax EBIT	**-10,895,250**	**-9,993,903**	**-3,418,520**	**8,164,888**	**13,017,270**
Depreciation	50,800	106,560	83,592	67,514	56,260
Amortisation	0	0	0	0	0
Post-tax cash flow	**-10,844,450**	**-9,887,343**	**-3,334,928**	**8,232,402**	**13,073,530**
Less capex	-279,000	-30,000	-30,000	-30,000	-30,000
Less change in working capital	-2,001	-674	-3,026	2,651	959
Provisions/other	0	0	0	0	0
Acquisitions/disposals	0	0	0	0	0
Free cash flow	**-11,125,451**	**-9,918,017**	**-3,367,954**	**8,205,053**	**13,044,489**
Discount coefficient	0	1	2	3	4
Discounted cash flow	-11,280,795	-8,939,833	-2,697,821	5,842,663	8,257,319
Sum of discount streams	53,001,484				
Terminal growth	2.0%				
Future value into perpetuity	178,755,284				
NPV of terminal value	55,806,618				
PV of cash flows	108,808,102				
PLUS: Value of investments	0				
PLUS: Value of tax losses	0				
LESS: Minority interests	0				
LESS: Net debt	5,283,000	(end June 2022)			
Equity value	114,091,102				
Ordinary shares	**3,625,733,111**	Assumes 1.5b shares issued at current share price of $0.01			
Value per share (A$)	**0.03**				
Discount Rate	12.5%				

Key sales inputs	
Device sales	A$50 per device
SaaS subscription	US$15 per patient per month
Data fees	-
Clinical trial services	-
Value-based contracting	-
Data science	-

Source: MST Access.

Upside risks to our valuation, based on key drivers, include higher-than-expected penetration of the serviceable market given greater-than-expected contracts won; better-than-assumed pricing for either device and/or SaaS subscriptions; future revenue streams going live; and lower-than-expected operating expenses relating to integration costs and marketing.

Downside risks to our valuation relate to the same assumptions and include higher-than-expected competition impacting pricing and Adherium's ability to achieve scale.

Exhibit 24 – DCF valuation sensitivity matrix: Terminal growth rate versus discount rate

Terminal growth rate \ Discount rate	0.030	11.5%	12.0%	12.5%	13.0%	13.5%
0%		0.03	0.03	0.03	0.03	0.03
1%		0.03	0.03	0.03	0.03	0.03
2%		0.04	0.03	0.03	0.03	0.03
3%		0.04	0.04	0.03	0.03	0.03
4%		0.04	0.04	0.04	0.03	0.03
5%		0.05	0.04	0.04	0.04	0.03

Source: MST Access.

Sensitivities and Risks

Adherium is operating in a relatively new and rapidly evolving segment of digital health. Commercialisation is still at an early stage and therefore exposes investors to various risks.

Competition

Explosive growth in telehealth and remote patient monitoring, spurred on by the COVID-19 pandemic, has attracted a wide array of companies, including both new entrants and existing players seeking to grow their digital healthcare offering. Nonetheless, and despite the merger of market leaders Teladoc and Livongo in 2020, the market in the digital respiratory management category remains highly fragmented.

We think Adherium's sensor technology coupled with relatively broad coverage of inhaler presentations represent a competitive advantage over current inhaler e-monitoring device companies. By extension these sensors represent a significant point of differentiation when bundled with the highly scalable cloud-based platform given its ability to integrate multiple data inputs to create a powerful combination in chronic care management. Longer term we see value coming from data science-enabled insights that can be used to personalise management.

Realising Adherium's potential will take time, which adds execution risk and the further threat of new entrants or potential downstream customers developing their own digital health solutions in-house. Further, maintaining market share and competitive positioning could require additional marketing costs or price discounting.

Customers

Adherium's multi-channel strategy should deliver significant economies of scale subject to numbers and breadth of channel partners in the customer mix at any point in time. While working with managers of large patient populations supports rapid scaling of the business an uneven distribution or concentration of revenues from a small group of customers in the mix could diminish pricing power. Further, contractual periods may not be competitive or acceptable, exposing the company to termination of large customer contracts and increased revenue volatility.

Resource and Capital Allocation

Adherium's commercial strategy relies on expansion of sensor coverage, integration of complimentary devices onto its platform and identification of appropriate partners. These steps will involve appropriate allocation of resources and capital. Notwithstanding the technical risk, the challenge will be to sequence business initiatives and allocate resources effectively given current operating losses against strategic objectives.

Product Development and Regulatory Approval

Innovation and new product development will be required to fend off new entrants and increasing competition from established players as the market evolves. There is no guarantee that the company's investment into new products will meet the changing demands of the market or maintain favour with existing clients. Regulatory approval of new products in the US and other jurisdictions will be required for the company to expand its offering and growth opportunities.

Reimbursement

Reimbursement is a key driver of adoption by physicians and payers. Recent changes to reimbursement policy in the US have been positive and largely driven by government responses to the COVID-19 pandemic. Although we think remote patient monitoring will persist, current levels of reimbursement could be reduced over time.

Board and Management

Board of Directors

Lou Panaccio, Independent Non-Executive Chair: Mr Panaccio is a Chartered Accountant with extensive management experience in the life sciences sector at the executive and board level. He is currently on the boards of ASX- and NASDAQ-listed Avita Therapeutics, ASX50 company Sonic Healthcare, and ASX-listed Rhythm Biosciences Limited. He is also a Non-executive Director of Unison Housing Limited, VGI Health Technology Limited, NeuralDX Limited (Non-executive Chairman from March 2019) and Haemokinesis Limited (from July 2021). Mr Panaccio holds a Bachelor of Economics from Monash University and is a member of the Australian Institute of Company Directors.

Jeremy Curnock Cook, Independent Non-Executive Director: Mr Curnock Cook was formerly head of the life science private equity team at Rothschild Asset Management in the UK where he was responsible for the launch of the first dedicated biotechnology fund for the Australian market. He has served on over 40 boards in various roles, including as chair of private and public biotechnology companies listed on the NASDAQ, LSE, TSX and ASX. He is currently Managing Director of BioScience Managers (manager of a major shareholder in Adherium), Chairperson of Avena Therapeutics and AmpliPhi Biosciences, a board member of Avita Medical and Rex Bionics, and acts as an alternative director for Sea Dragon Ltd. Mr Curnock Cook was previously a director of Bioxyne Limited and Phylogica Limited.

George Baran, **Non-Executive Director:** Mr Baran has over 35 years of experience in the medical device industry and serves as Executive Chair of the Trudell Medical Limited Board of Directors as well as being a significant shareholder. In addition to his role at Trudell, Mr Baran is an active investor in and Director of several medical device and e-health/connected care companies including Sensory Technologies, Mozzaz Corporation, and Sky Medical Technology Inc. He was also a lead investor and a former Director of Vanrx Phamasystems, which was recently acquired by Cytiva Life Sciences. Mr Baran has been responsible for the marketing of new drug delivery technologies to medical opinion leaders and major pharmaceutical companies. This has included collaboration with business and clinical partners in the design and co-ordination of clinical studies. He has also been granted several US and international patents for medical devices for drug delivery and minimally invasive surgery.

Bruce McHarrie, Independent Non-Executive Director: Mr McHarrie is an independent director and consultant with over 20 years' experience in the health and life sciences sectors. Prior roles include CFO, Director of Operations and Director of Strategic Projects of Telethon Kids Institute in Perth, WA; Senior Manager at Deloitte in London; and Assistant Director of the Bioscience Unit at Rothschild Asset Management, a life sciences private equity group investing in early-stage biotechnology and healthcare companies. Outside his role at Adherium, he is an advisor to BioScience Managers, a director at AusCann (Australasian Medical Cannabis) and an independent consultant.

William Hunter, Independent Non-Executive Director: Dr Hunter has extensive experience in commercialising medical device technologies. He co-founded Angiotech Pharmaceuticals in 1992, serving as CEO from 1997 through its IPO and Toronto Stock Exchange and NASDAQ listings. Dr Hunter has over 200 patents and patent applications to his name and products in which he was an inventor or co-investor, which have generated revenues of over $12 billion and have helped over 6 million patients globally. He is currently President and CEO of Cardiome Pharma Corp (NASDAQ: CRME), a Director of Rex Bionics, Co-Founder of Canary Medical and is an Industry Expert Advisor for BioScience Managers. He previously served as a director of Epirus Biopharmaceuticals (NASDAQ: EPRS) and Union Medtech.

James Ward-Lilley, Independent Non- Executive Director: Mr Ward-Lilley has had an extensive global pharmaceutical career, spanning 28 years across a range of mostly commercial roles at AstraZeneca (AZN) before becoming CEO of Vectura Group, an inhaled formulation and device development specialist. His tenure from 2015 to 2019 included the company's successful merger with Skyepharma. Mr Ward-Lilley's last role at AZN was to lead the Respiratory, Inflammation & Autoimmunity franchise, which revitalised one of the company's three core therapeutic areas including the acquisitions of Almirall's respiratory business and Pearl Therapeutics. He led AZN's corporate device strategy in 2014/15 and was the key sponsor for AZN's initial investment in Adherium at the time of the IPO in 2015.

Executive Team

Rick Legleiter, Chief Executive Officer: Mr Legleiter joined Adherium with more than 20 years of experience in global healthcare and medical technology across the United States, Australia, Europe, and Asia. He has extensive experience in strategic-growth platforms, commercial development and cross-border expansions, customer service and company turnarounds. Previous roles include executive positions at Universal Biosensors (UBI.AX) in Australia; Senior Vice President and corporate account management roles at Siemens Healthcare in Germany; and more recently consultant for global healthcare clients in the United States and China focused on the COVID pandemic.

Geoff Feakes, Chief Technology Officer: Mr Feakes joined Adherium with more than 25 years of information technology governance, service provision and management, as well as solution innovation and technology leadership across Australia and internationally including the USA, Europe, and Asia. In recent years he has been Tunstall APAC's Chief Technology Officer, Tunstall Group's Global Technical Director of Health, Global Technical Director (IT Services), as well as Tunstall Group's Chief Information Officer. Mr Feakes is a former board member and Vice Chair of Australia's Personal Emergency Response Services Limited (PERSL), committee member of the Medical Technology Association of Australia (MTAA) Industry Committee and the Connected Health Advisory Group (CHAG).

Rob Turnbull, General Manager and Joint Company Secretary: Mr Turnbull has over 25 years' corporate experience, starting his career with PricewaterhouseCoopers where he worked in Auckland, Toronto, and London; and has over 15 years' experience with technology and life-sciences companies. He has also been CFO for an ASX-listed biotech company undertaking multiple international studies ranging from preclinical to clinical Phase 3, and with operations in the United States, Australia and New Zealand. In addition to capital markets financing and compliance, treasury, tax, financial reporting, commercial contract negotiations and general management, he has been involved in M&A activity to acquire and develop specific technologies.

Francis White, Vice President, Global Business Development: Mr White has over 30 years' experience in digital health and medical device commercialisation roles and executive positions in a raft of companies including Medtronic. Recent roles include Managing Director of Olympus Medical UKIE, where he led commercial operations and introduced Health Economics and Market Access initiatives; and Vice President Sales and Business Development at Silicon Valley–based AliveCor in charge of scaling up international business in the emerging field of AI-powered mobile health.

Tara Creaven-Capasso, Vice President, Quality, Regulatory & Clinical Affairs: Ms Creaven-Capasso has over 25 years of international experience as a regulatory and quality executive specialising in the provision of Regulatory Affairs, Quality Assurance and Compliance services to the Biotechnology, Pharmaceutical, Medical Device and Medicinal Cannabis sectors. She is based in the USA and has held various roles in large healthcare organisations including Elan Pharmaceuticals Inc., Medtronic Inc, ISTA Pharmaceuticals, and Bluegrass Vascular Technologies Inc. In 2014, Ms Creaven-Capasso co-founded Caduceus Medical Development, Ltd. (NZ), an international consulting organization with offices in the USA and New Zealand.

Keven Gessner, Executive VP-Advisor: Mr Gessner has over 25 years of experience in the pharmaceutical industry in senior roles leading digital health initiatives for both Teva and Astra Zeneca. His most recent role was VP of US Digital Health, Marketing, and Market Access for Teva. Prior experience includes 17 years at GlaxoSmith Kline GmbH in various roles.

Appendix 1: Top 20 Shareholders

Exhibit 25 – Top 20 shareholders (as of 12 August 2022)

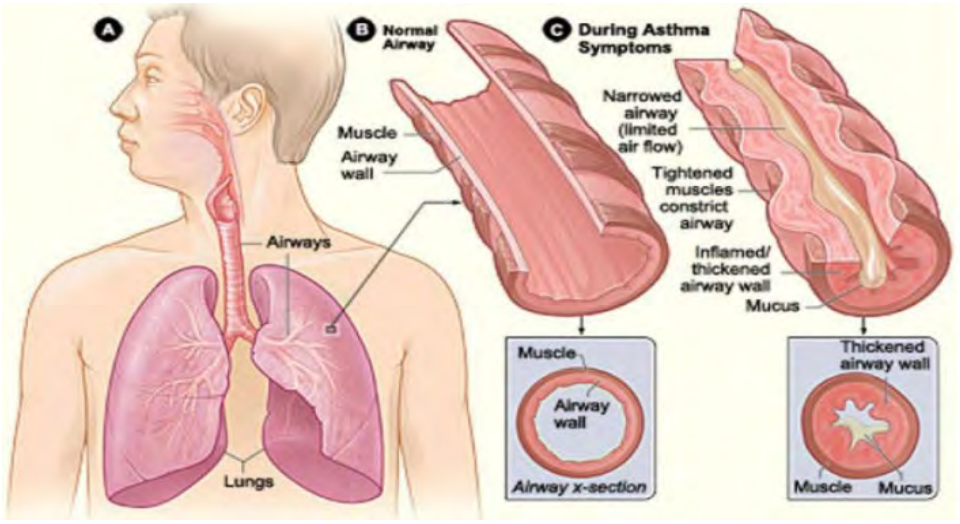
Ordinary Shareholders	Number	Percentage
BioScience Managers Pty Ltd	548,808,957	24.85%
Trudell Medical Ltd	423,080,272	19.16%
Viburnum Funds Pty Ltd	219,057,245	9.92%
Fidelity International Ltd	211,645,356	9.58%
Regal Partners Limited	99,893,433	4.52%
K1W1	80,503,018	3.65%
Summatix Pty Ltd	35,496,341	1.61%
Phillip Thematic Fund Pte.Ltd.	33,333,333	1.51%
Planet Innovation Pty Ltd	26,666,667	1.21%
James Middleweek	17,925,445	0.81%
Anne Bell	13,176,095	0.60%
Bryan Mogridge	10,303,149	0.47%
AstraZeneca PLC	8,079,720	0.37%
JMID Pty Ltd	7,624,555	0.35%
Calcium Investments Limited	7,112,779	0.32%
IG Investment Management, Ltd.	5,515,000	0.25%
Garth Sutherland	5,174,885	0.23%
Geoff Feakes	4,500,000	0.20%
Mackenzie Investments Asia Limited	4,020,000	0.18%
James Ward-Lilley	3,599,611	0.16%
TOTAL	**1,765,515,861**	**79.95%**

Source: IRESS.

Appendix 2:
Understanding Asthma: Overview of Disease and Treatment

What is asthma? Asthma is a common lung condition in which the airways swell and narrow, causing sporadic breathing difficulties (see Exhibit 26). It often starts in childhood (and is the most common chronic disease among children globally), but can also develop in adults, and affects people of all ages—more than 339m people have the disease worldwide. There is currently no cure, but treatment can help control the symptoms, allowing patients to live full and rewarding lives. Over 80% of asthma-related deaths occur in low- and lower-middle-income countries.

Exhibit 26 – Pathophysiology of asthma



Source: www.nationalasthma.org.au/understanding-asthma/what-is-asthma.

What causes asthma? The fundamental causes of the disease are likely to be a combination of:

- genetics (e.g., if your parents have it or it is common in your family)
- external triggers: allergies (dust mites, pollen, fur); respiratory illness; tobacco smoke and pollution; cold air; chemical irritants (paint, varnishes, adhesives); extreme emotional duress; exercise; and certain medicines.

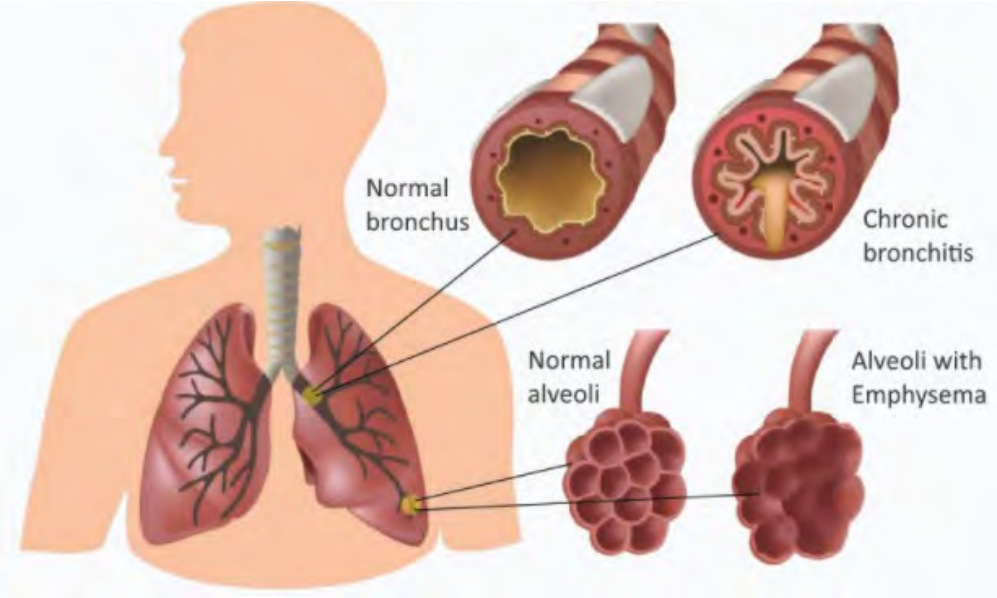
What are the symptoms? Symptoms include breathlessness, coughing, chest tightness and pain, and wheezing. Their severity and frequency vary from person to person. For some, they become worse with physical activity and at night, leading to sleeplessness and thus fatigue and disruptions to daily life. Asthma attacks are episodes where asthma symptoms worsen significantly, sometimes preventing the patient from speaking, eating or sleeping. Asthma attacks can be fatal but are largely preventable and manageable through regular checkups and the right treatment. Severe and difficult-to-treat asthma is asthma that requires treatment with high-dose inhaled glucocorticoids or other controllers or that cannot be controlled by such treatment. The criteria for uncontrolled asthma include exacerbations, poor symptom control, lung-function impairment, or a combination of these.

What treatment is available? Asthma is incurable but can be managed with regular medical checks and treatment. People with ongoing symptoms will need to take daily medication long term—often an inhaler to breathe in medicines—and work with their doctor to identify and avoid their triggers. Therapies include inhaled 'relievers' (which open the airways to relieve symptoms short term) and 'preventers' (which, when taken regularly, prevent symptoms from occurring and reduce the risk of flare-ups). Inhaled corticosteroids alone or in combination with long-acting bronchodilators or leukotriene pathway inhibitors are the cornerstone for treatment of asthma.

Appendix 3:
Understanding COPD: Overview of Disease and Treatment

What is COPD? COPD, or chronic obstructive pulmonary disease, is a progressive lung disease. It causes obstruction and narrowing of the respiratory tract due to prolonged damage to the respiratory system and makes it hard to breathe. It develops as a significant and chronic inflammatory response to inhaled irritants including chronic bronchitis, bronchiectasis and emphysema.

Exhibit 27 – Pathophysiology of COPD



Source: www.medwell.hk/learn-about-copd.

What causes COPD? COPD occurs when the lungs and respiratory tract become damaged and inflamed. It is usually associated with long-term exposure to substances that irritate and damage the lungs. The main causes may include:

- long-term cigarette smoking (including second-hand smoke)
- occupational exposure to workplace dusts and chemicals
- air pollution
- genetics.

What are the symptoms? In the early stages of COPD, there may be no symptoms or symptoms can be quite mild, beginning with coughing and shortness of breath. The disease can get progressively worse, making it increasingly difficult for the patient to breathe. The main symptoms include shortness of breath, chronic coughing, production of large amounts of sputum, chest tightness, and lack of energy, especially during physical activities.

What treatment is available? COPD has no cure at this time; doctors do not have any ways to repair the damage to the lungs. However, suitable treatments and lifestyle changes can help patients to ease symptoms, control the disease and reduce the risk of complications. Medications, oxygen therapy, and surgery are some forms of treatment. For most people with COPD, short-acting bronchodilator inhalers are the first treatment used. Bronchodilators are medicines that make breathing easier by relaxing and widening the patient's airways. Commonly used short-acting bronchodilators include salbutamol and terbutaline, both beta-2 agonists.

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Level 13, 14 Martin Place, Sydney, NSW 2000
Main +61 2 8999 9988
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