MIRAE ASSET
Building on principles

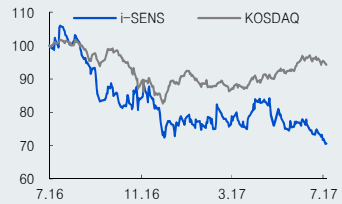
MedTech

Earnings Preview
July 12, 2017

(Maintain)	**Buy**
Target Price (12M, W)	**40,000**
Share Price (07/11/17, W)	26,350
Expected Return	52%

OP (17F, Wbn)	29
Consensus OP (17F, Wbn)	29
EPS Growth (17F, %)	12.7
Market EPS Growth (17F, %)	39.6
P/E (17F, x)	18.3
Market P/E (17F, x)	10.0
KOSDAQ	656.01
Market Cap (Wbn)	362
Shares Outstanding (mn)	14
Free Float (%)	75.4
Foreign Ownership (%)	40.1
Beta (12M)	1.01
52-Week Low	26,300
52-Week High	39,500

(%)	1M	6M	12M
Absolute	-9.3	-9.1	-28.7
Relative	-6.8	-11.6	-24.2



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i-SENS

(099190 KQ)

Steady earnings and attractive valuation

2Q17 preview: Robust top-line growth

For 2Q17, we expect i-SENS to post revenue of W39.7bn (+20.5% YoY). Revenue from the company's core business, blood glucose monitors (strips and meters), likely expanded 11.9% YoY to W35.1bn. In the other segment, revenue likely jumped 192% YoY to W4.6bn, bolstered by: 1) the growth of point-of-care testing (POCT); and 2) last year's acquisition of blood gas analyzer CoaguSense.

We estimate 2Q17 operating profit at W7bn (+3.4% YoY). We believe earnings were pressured by: 1) higher spending associated with the market penetration of the company's in-house brand (CareSens); and 2) increased SG&A expenses at newly established overseas subsidiaries (China and India) as well as CoaguSense. As we move further into 2H17, we expect profit margins to recover on the back of top-line growth.

Steadiness is a key merit of the blood glucose monitor market

1) Strong blood glucose monitoring market: i-SENS generates more than half of its revenue from major global customers, including Arkray and AgaMatrix. In 2Q17, we estimate revenue from these customers grew 15.4% YoY. Looking ahead, we believe growth will be driven by the company's own brands and the Chinese market. The company recorded revenue of W17.1bn from China in 2016 and is targeting W50bn by 2020.

2) POCT business to take off: In addition to blood glucose monitoring systems, i-SENS is also expanding into in-vitro diagnostics. In the POCT segment, the company currently sells blood gas analyzers and hospital-use diabetes management systems. In 2017, we expect blood gas analyzers (developed in 2015) to generate more meaningful revenue, and project the CoaguSense acquisition to add W8bn to annual revenue.

As part of a government-funded project, i-SENS has been working on developing continuous glucose monitoring (CGM) systems since 2015. Clinical tests are scheduled for 2H17, with commercialization targeted for 2019. The company is also developing immunoassay systems (for cardiovascular diseases), with commercialization targeted for 2018.

Maintain Buy and TP of W40,000

We maintain our Buy call and target price of W40,000 on i-SENS. The stock is trading at a 12-month forward P/E of 15.2x, a historical low and below the average valuation of global peers (19x). The company is continuing stable growth, supported by its global customer base and acquisition of new accounts. ODM/OEM revenue is looking strong, while expectations for growth in China remain intact.

FY (Dec.)	12/14	12/15	12/16	12/17F	12/18F	12/19F
Revenue (Wbn)	96	102	132	162	184	214
OP (Wbn)	18	19	26	29	36	42
OP margin (%)	18.8	18.6	19.7	17.9	19.6	19.6
NP (Wbn)	14	15	18	20	27	32
EPS (W)	1,063	1,077	1,280	1,443	1,979	2,327
ROE (%)	13.1	11.8	12.5	12.5	15.0	15.3
P/E (x)	39.6	31.6	23.0	18.3	13.3	11.3
P/B (x)	4.9	3.5	2.7	2.2	1.9	1.6
Dividend yield (%)	0.0	0.0	0.3	0.4	0.4	0.4

Note: All figures are based on consolidated K-IFRS; NP refers to net profit attributable to controlling interests
Source: Company data, Mirae Asset Daewoo Research estimates

Chinese market to drive future growth

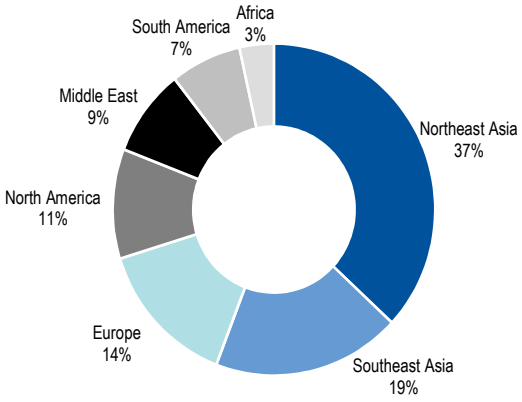
1. Diabetes-related spending is determined by economic level and government policies

Key statistics indicate that spending on the treatment of diabetes is proportional to a country's economic level, rather than the size of its diabetic population.

Asia accounts for the highest proportion (56%) of the world's diabetic population, followed by Europe (19%) and North America (14%). Of note, the regional breakdown of the blood glucose monitor market is significantly different, with the North American market accounting for the largest share (49%), followed by Europe (25%).

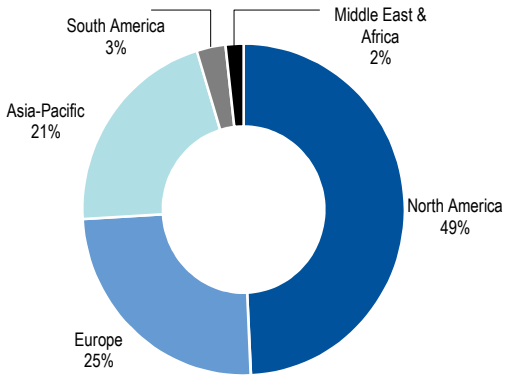
Notably, it is estimated that 46% of diabetics are unaware of their condition. By region, the percentage of undiagnosed patients is higher in Africa and Asia than Europe and North America.

Figure 1. Diabetic population breakdown



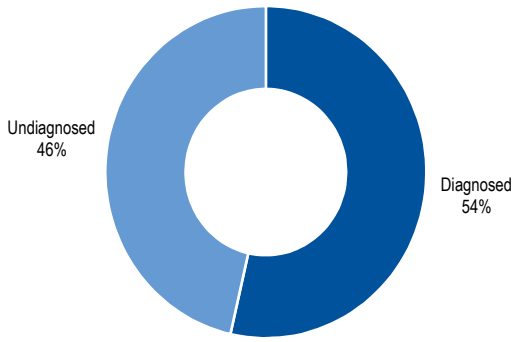
Source: IDF, Mirae Asset Daewoo Research

Figure 2. Blood glucose monitor market breakdown



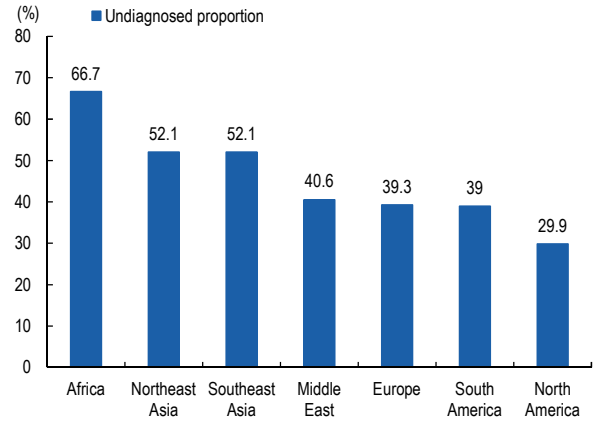
Source: KHIDI, Global data, Mirae Asset Daewoo Research

Figure 3. Undiagnosed vs. diagnosed diabetic population



Source: IDF, Mirae Asset Daewoo Research

Figure 4. Percentage of undiagnosed diabetic patients by region

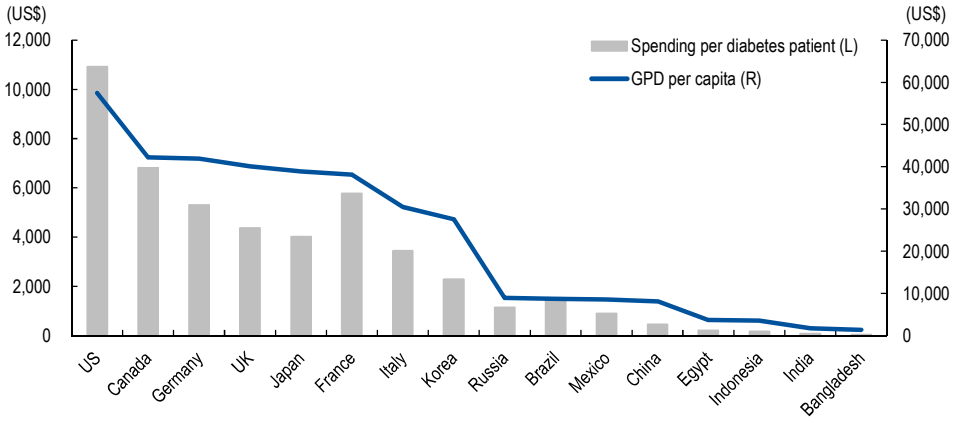


Source: IDF, Mirae Asset Daewoo Research

For diabetics, it is important to maintain a healthy lifestyle and check blood glucose levels regularly. Given that it costs W500,000-1.5mn annually for a patient to receive regular blood glucose level checkups, non-insulin-dependent diabetics are likely to prioritize immediate basic needs (e.g., food, shelter, etc.) over regular checkups.

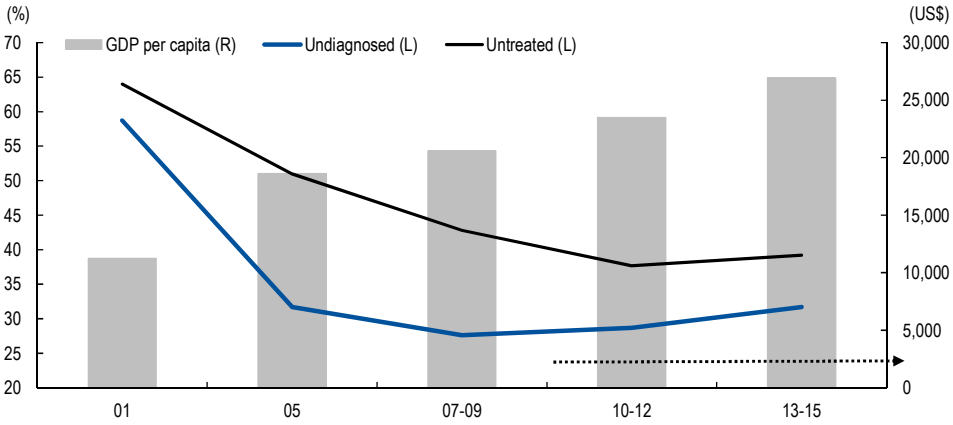
Diabetes prevalence is similar by country; thus, spending on the treatment of diabetes is proportional to a country's economic level rather than the size of its diabetic population. Indeed, countries with higher GDPs display more diagnosed cases of diabetes and higher per-capita spending on diabetes treatment. In Korea, undiagnosed and untreated diabetics accounted for 58.7% and 64.0%, respectively, of the total diabetic population in 2001, when per-capita GDP stood at around US$10,000. These figures fell to 31.7% and 39.2%, respectively, in 2015, when per-capita GDP climbed to the high-US$20,000 level.

Figure 5. Diabetes-related spending is correlated with a country's economic level



Source: IDF, IMF, Mirae Asset Daewoo Research

Figure 6. Proportions of undiagnosed and untreated diabetics in Korea have fallen



Source: IMF, MOHW, Korea Centers for Disease Control & Prevention, Mirae Asset Daewoo Research

2. Future growth driver: Chinese blood glucose monitor market

China is home to the world's largest diabetic population. Among the world's 400mn diabetics, around 100mn are estimated to reside in China. In 2015, China saw 1.3mn diabetes-related deaths (vs. 5mn globally), with 40% of the cases involving patients 60 years old or younger. As such, the Chinese government has designated diabetes as one of the country's five major diseases.

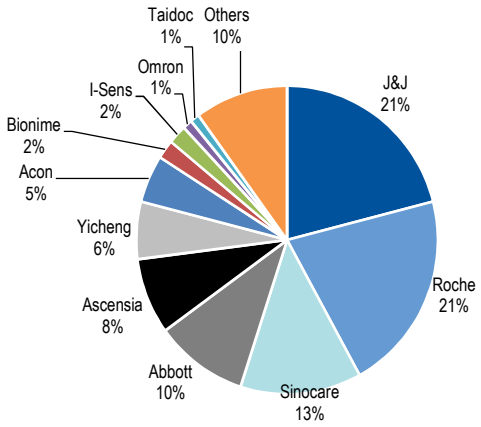
However, the size of the Chinese blood glucose monitor market is still estimated at only around W900bn (vs. the global market of W13.7tr). Given that the Chinese economy is steadily growing, and that the government is striving to control diabetes, diabetes-related spending will likely increase in China.

Of note, multinational companies currently control more than 50% of the Chinese blood glucose monitor market, while local players account for 35%. The market share of i-SENS stands at 1.9% (ninth in terms of revenue).

In China, the glucose test strip market can be divided into the hospital-use (high-end) and OTC (low/medium-end) segments. Thus far, i-SENS has been focusing on the former category. Since its incorporation in 2014, the company's Chinese subsidiary has been engaging in aggressive marketing activities, completely taking over operations from a local agency partner in 2016. Against this backdrop, revenue from China climbed from W6.2bn in 2015 to W17.1bn in 2016 (+175.8% YoY).

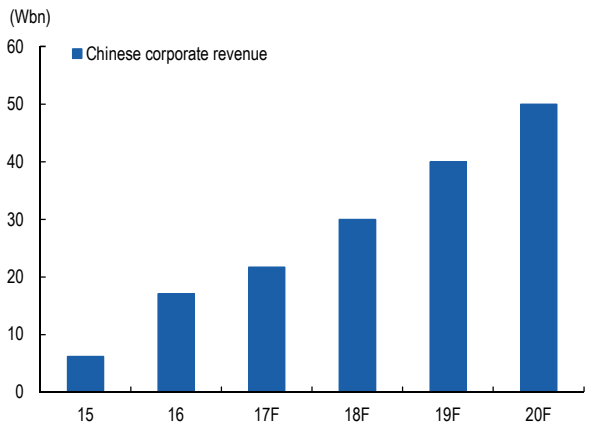
The firm has also been expanding its OTC business by distributing glucose meters at close to break-even margins through partnerships with local Chinese players Dascom and Keyuan. The glucose meter/test strip market bears similarities with the cartridge razor market, in which manufacturers/retailers sell razors at low prices to facilitate future blade cartridge sales. Notably, Dascom provides online and mobile fitness management services for up to 1mn customers in China, and Keyuan engages in the distribution of household-use MedTech devices via 70 retailers (directly-operated stores and distribution agents combined).

Figure 7. Blood glucose monitor M/S breakdown for China



Source: Company data, Mirae Asset Daewoo Research

Figure 8. Chinese subsidiary's revenue trend



Source: Company data, Mirae Asset Daewoo Research

In August 2015, i-SENS became the first foreign company to build a test strip factory in Zhangjiagang Industrial Complex, located in Jiangsu, China. Initial capacity is set at 300mn strips per year, but capacity may expand up to sixfold to 1.8bn strips, assuming more production lines are added. The facility is awaiting government approval, and production is forecast to begin in 2H17. Looking ahead, it is expected to serve as the firm's production base for both the Asian market and the OTC market.

Most multinationals that operate in China without a local production base suffer from weak cost competitiveness, even if their market shares are large. Currently, i-SENS exports strips manufactured in Wonju, Korea, with margins close to the break-even point. Once the Chinese facility comes online and cranks up production, we expect OP margin to rise sharply, to around 30%.

While items supplied to hospitals may still be manufactured in Korea to minimize the risk of technology theft, the firm may also opt for assembly in China.

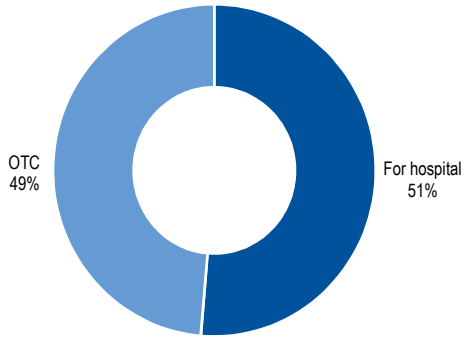
As strip supply to hospitals increases, the OTC market is also anticipated to expand further. The OTC segment, which accounts for roughly half of China's glucose monitor market, is dominated by Chinese makers. But once i-SENS's Chinese facility comes online, the firm should be able to offer OTC products at more competitive prices. Moreover, given its technological prowess, product quality, and solid track records in transactions with global customers, the firm should be able to gain market share in the OTC segment.

Up until last year, the firm had recorded W17.1bn in revenue from products used in Chinese hospitals. As the OTC market grows, we expect i-SENS's China revenue to expand robustly (company target: W50bn by 2020) following the start of production at the new facility in Jiangsu.

Figure 9. Facility in Jiangsu

Source: Company materials, Mirae Asset Daewoo Research

Figure 10. Chinese test strip market breakdown



Source: Company data, Mirae Asset Daewoo Research

Table 1. 2Q17 preview (Wbn, %)

	2Q16	1Q17	2Q17F		Growth	
			Mirae Asset Daewoo	Consensus	YoY	QoQ
Revenue	32.9	36.0	39.7	40.2	20.5	10.4
Operating profit	6.7	5.3	7.0	7.3	3.4	31.0
OP margin	20.5	14.8	17.6	18.2	-2.9	2.8
Pretax profit	5.6	2.9	6.7	7.0	20.5	131.4
Net profit	3.5	2.4	5.0	5.8	41.5	113.3

Notes: Based on consolidated K-IFRS; net profit is attributable to controlling interests
Source: Company data, Mirae Asset Daewoo Research estimates

Table 2. Earnings forecast revisions (Wbn, W, %)

	Previous		Revised		% chg.	
	2017F	2018F	2017F	2018F	2017F	2018F
Revenue	164.7	187.4	161.7	184.1	-1.8	-1.8
Operating profit	29.5	38.6	29.1	35.6	-1.5	-7.7
Pretax profit	26.2	37.2	25.8	34.5	-1.3	-7.3
Net profit	20.1	29.4	19.8	27.2	-1.7	-7.7
EPS	1,467	2,146	1,443	1,979	-1.7	-7.7

Notes: Based on consolidated K-IFRS; net profit is attributable to controlling interests
Source: Mirae Asset Daewoo Research estimates

Table 3. Quarterly earnings (Wbn, %)

	1Q16	2Q16	3Q16	4Q16	1Q17	2Q17F	3Q17F	4Q17F	2016	2017F	2018F
Revenue	**28.7**	**32.9**	**33.5**	**37.3**	**36.0**	**39.7**	**41.7**	**44.3**	**132.5**	**161.7**	**184.1**
Glucose monitoring	27.2	31.4	32.1	34.5	32.3	35.1	37.3	39.3	125.1	144.0	163.4
POCT	1.3	1.4	1.4	1.8	1.4	2.2	2.1	2.7	6.0	8.4	9.3
Other	0.2	0.1	0.0	1.0	2.2	2.4	2.3	2.4	1.4	9.2	11.4
Operating profit	**5.4**	**6.7**	**6.9**	**6.6**	**5.3**	**7.0**	**7.8**	**8.9**	**25.7**	**29.1**	**35.6**
Pretax profit	**4.9**	**5.6**	**5.9**	**6.3**	**2.9**	**6.7**	**7.6**	**8.7**	**22.7**	**25.8**	**34.5**
Net profit	**3.7**	**3.5**	**5.1**	**5.1**	**2.4**	**5.0**	**5.9**	**6.5**	**17.6**	**19.8**	**27.2**
OP margin (%)	19.0	20.5	20.7	17.7	14.8	17.6	18.8	20.2	19.4	18.0	19.3
Pretax margin (%)	16.9	16.9	17.7	17.0	8.1	16.9	18.1	19.5	17.1	16.0	18.7
Net margin (%)	13.1	10.8	15.3	13.7	5.5	12.7	14.1	14.8	13.3	12.2	14.8

Source: Company data, Mirae Asset Daewoo Research estimates

Appendix: Self-monitoring vs. continuous monitoring

1. Overview of diabetes

Generally speaking, a patient is diagnosed with diabetes if his or her:

1) blood glucose level (random) exceeds 200mg/dL;

2) fasting blood sugar level exceeds 126mg/dL;

3) postprandial plasma glucose level exceeds 200mg/dL; or

4) glycated hemoglobin is 6.5% or higher.

Type 1 diabetes is a condition in which the body produces very little or no insulin, and type 2 diabetes occurs when the body does not produce sufficient insulin. Type 1 patients, which account for less than 2% of the total diabetic population, is an autoimmune disorder in which the body destroys its own insulin-making pancreatic cells (beta cells). The disease is usually diagnosed in children and young adults. Meanwhile, type 2 is known to be caused by various factors, including diet, stress, and genetic risks.

For diabetes, treatment is highly focused on management. At present, the disease can only be cured only through pancreas/pancreatic islet cell transplants. However, such procedures could lead to rejection and other serious complications. Accordingly, management of blood glucose levels based on thorough monitoring is considered the most efficient way of treating diabetes for now.

Table 4. Types of diabetes

Type	Details
Type 1 diabetes	· Caused by a lack of insulin due to destruction of beta cells · Mostly diagnosed in children and young adults · Treated via insulin therapy
Type 2 diabetes	· Caused by insufficient insulin · Most common type of diabetes in Korea · Frequently found in people in their 40s and older; over half of patients are overweight or obese
Other diabetes	· Caused by pancreatic diseases, endocrine disorders, exposure to harmful chemical substances, insulin receptor disorders, and/or genetic issues
Gestational diabetes	· First diagnosed during pregnancy · Normalization after birth in most cases

Source: Korean Diabetes Association, Mirae Asset Daewoo Research

Globally, 410mn people are estimated to suffer from diabetes in 2015 (prevalence rate of 8.8%), with half of all cases being undiagnosed. By region, Asia accounts for the highest proportion of cases (56%), followed by Europe (14%), North America (11%), the Middle East (9%), South America (7%), and Africa (3%). Amid population aging and the spread of the Western diet, the number of diabetes patients is projected to rise to 640mn by 2040.

Table 5. Global diabetic population (mn, %)

	15	40F	CAGR	MS
Northeast Asia	153.2	214.8	1.4	37
Southeast Asia	78.3	140.2	2.4	19
Europe	59.8	71.1	0.7	14
North America	44.3	60.5	1.3	11
Middle East	35.4	72.1	2.9	9
South America	29.6	48.8	2.0	7
Africa	14.2	34.2	3.6	3
Total	414.8	641.7	1.8	100

Source: IDF, Mirae Asset Daewoo Research

Table 6. Global statistics on diabetes

	2015	2040F
Total global population	7.3bn	9bn
Adult population (20-79 years)	4.72bn	6.16bn
Child population (0-14 years)	1.92bn	
Diabetes (20~79 years)		
Global prevalence	8.8% (7.2-11.4%)	10.4% (8.5-13.5%)
Number of people with diabetes	415mn	642mn
Number of deaths due to diabetes	5 mn	-
Total health expenditure	US$673bn	US$802bn
Hyperglycemia in pregnancy (20-49 years)		
Proportion of live births affected	16.20%	-
Number of live births affected	20.9mn	-
Impaired glucose tolerance (20-79 years)		
Global prevalence	6.7% (4.2-12.1%)	7.8% (5.2-13.9%)
Number of people with impaired glucose tolerance	318mn	481mn
Type 1 diabetes (0-14 years)		
Number of children with type 1 diabetes	542,000	-
Number of newly diagnosed cases each year	86,000	-

Source: IDF, Mirae Asset Daewoo Research

Table 7. Key statistics (mn, US$bn, US$)

	Diabetic population	Diabetes-related spending	Diabetes-related spending per patient	Per-capita GDP
China	109.6	51.0	465	8,113
India	69.2	6.6	95	1,723
US	29.3	320.0	10,922	57,436
Brazil	14.3	22.0	1,538	8,727
Russia	12.1	14.0	1,157	8,929
Mexico	11.5	10.5	911	8,555
Indonesia	10	1.7	171	3,604
Egypt	7.8	1.7	219	3,685
Japan	7.2	29.0	4,028	38,917
Bangladesh	7.1	0.4	51	1,411
Germany	6.6	35.0	5,315	41,902
France	3.3	19.0	5,782	38,128
Canada	2.5	17.0	6,824	42,210
UK	3.0	13.0	4,373	40,096
Italy	3.5	12.0	3,450	30,507
Korea	3.4	7.7	2,294	27,539

Source: IDF, Mirae Asset Daewoo Research

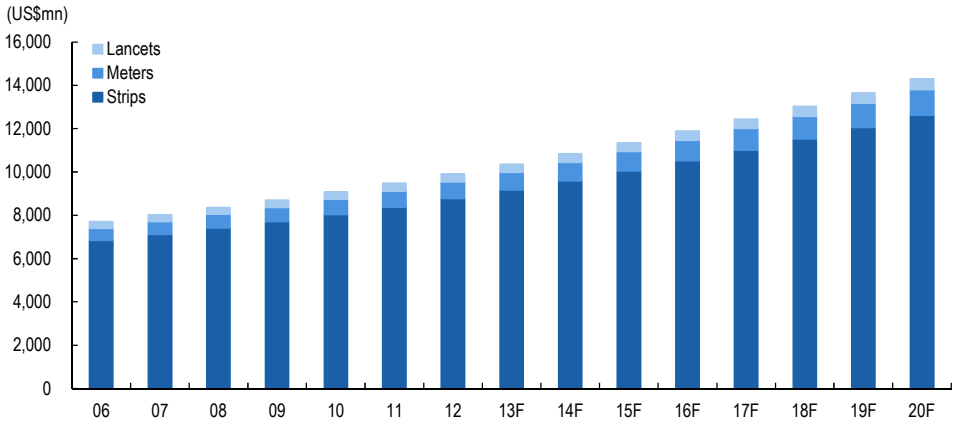
2. Diabetes and blood glucose monitors

As discussed above, the treatment of diabetes focuses almost exclusively on management. Notably, the self-monitoring of blood glucose (SMBG) is invaluable for diabetes management, and related equipment has become the largest contributor to the in-vitro diagnostics market.

Glucose monitoring devices account for 18% of the in-vitro diagnostics market. And the growth of glucose monitoring has accelerated rapidly as devices become increasingly smaller. We project that the global glucose monitor market will reach US$12.45bn in 2017, with test strips (consumables) alone accounting for roughly 88% of the entire market.

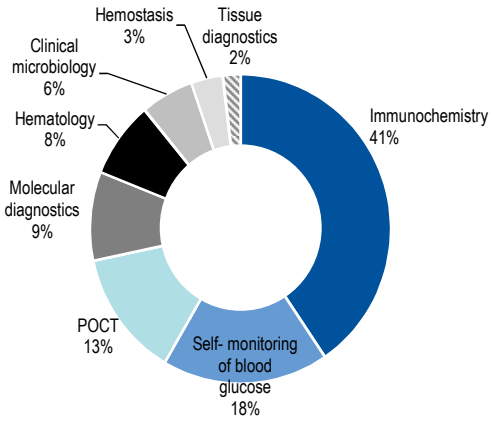
We project the glucose monitor industry to expand by an average of 4.7% annually until 2020, reaching US$14.31bn in 2020. Currently, the market is dominated by four firms, including Roche (Switzerland), Johnson & Johnson (US), Ascensia (formerly Bayer Diabetes Care), and Abbott (US), whose collective market share stands at 86%.

Figure 11. Global market for blood glucose monitoring devices



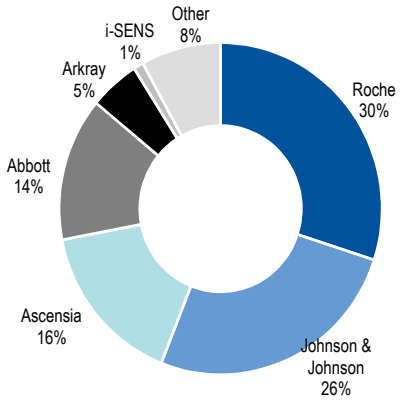
Source: GlobalData, KHIDI, Mirae Asset Daewoo Research

Figure 12. Breakdown of in-vitro diagnostics market



Source: Frost & Sullivan, Mirae Asset Daewoo Research

Figure 13. Global M/S breakdown for blood glucose monitoring devices



Source: GlobalData, KHIDI, Mirae Asset Daewoo Research

A blood glucose monitor is comprised of a meter, a test strip (biosensor), and a lancet. As a new strip is required for each test, glucose test strips make up roughly 88% of the market.

The two most common monitoring methods are photometric and electrochemical detection. Most monitors today use the latter method, as it requires less blood and time.

Recently, manufacturers have been endeavoring to contribute additional value. One such example is “no coding” technology. While existing meters need to be manually calibrated to recognize a batch code encrypted in each test strip, “no coding” technology ensures that meters recognize the code automatically when a test strip is inserted.

3. Barriers to SMBG

Checking one's glucose levels is an important part of managing diabetes, and many studies show that glucose management helps reduce diabetes-related risks significantly. However, very few patients faithfully monitor their blood glucose levels.

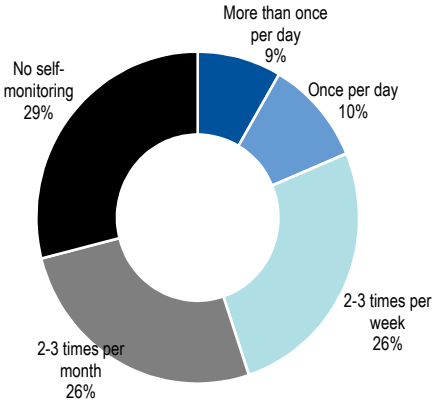
According to a 2001 survey conducted by the American Diabetes Association (ADA), only a small number of diabetic patients test their own blood glucose levels. Only 5-6% of diabetic patients test their blood glucose levels at least once a day, and 65% of those on medication test themselves less than once a month. Ascensia's 2015 survey of Korean diabetic patients tells a similar story. The survey found that about 30% of respondents did not check their blood glucose levels at all, and only 19% of those surveyed took the test more than twice a day.

While the proportions of undiagnosed and untreated diabetes cases dropped sharply amid corrective policy actions and economic growth in the early 2000s, they have remained flattish at 30% and 40%, respectively, in recent years.

Patients may shudder at the thought of pricking their own fingers, and some patients need to give themselves insulin injections as well. The stress of SMBG has negative effects on self-esteem and may lead to depression. People with diabetes are two to three times more likely to suffer depression than others. It is particularly stressful for type 1 diabetics, most of whom are children and teenagers, to draw blood and give insulin shots.

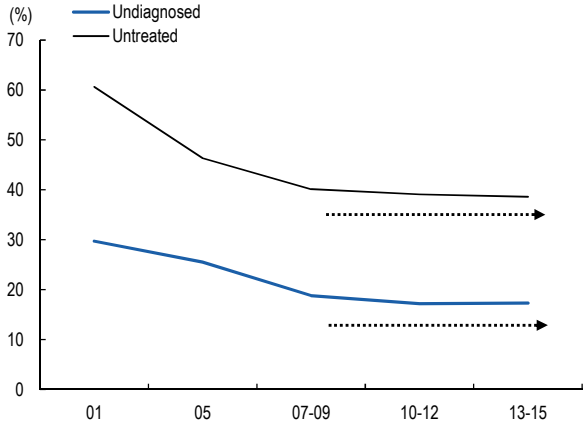
In addition, type 2 diabetes accounts for 98% of all diabetic cases. People with type 2 diabetes may not take the disease as seriously as those with type 1 diabetes. As type 2 patients do not see immediate consequences, they are less motivated to take preventive actions.

Figure 14. Frequency of SMBG



Note: Based on Ascensia's survey of 107 diabetic patients in Seoul and Gyeonggi-do in January 2015
Source: Mirae Asset Daewoo Research

Figure 15. Undiagnosed cases vs. untreated cases



Source: MOHW, KCDC, Mirae Asset Daewoo Research

4. CGM systems

Although SMBG offers the convenience of keeping track of blood glucose levels without visiting the hospital, blood collection can become a cause of stress for patients. An even bigger problem is the fact that the process only offers blood glucose readings for discrete points in time rather than a complete data set.

Generally speaking, the main goal for diabetics is the minimization of fluctuations in glucose levels. However, a few data points per day do not offer a complete picture of a patient's glucose levels. In addition, it is difficult to monitor changes in sleeping glucose levels with conventional glucose monitors. These issues could have fatal consequences for type 1 diabetics.

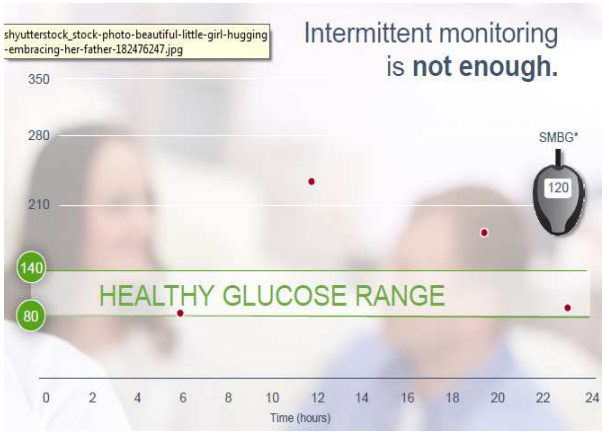
Continuous glucose monitoring (CGM) has thus been presented as an alternative to conventional SMBG. CGM presents real-time data on glucose levels and changes over time. Among the various methods of CGM, the insertion of a thin wire sensor just under the skin to monitor glucose levels in the interstitial fluid is the most common. CGM systems collect and store data on interstitial glucose levels every five minutes and offer information on changes in glucose levels over time. Other CGM methods are in need of further technological developments to improve accuracy levels.

Table 8. Glucose monitoring methods

Method	Sample collection	Sample collection site	Glucose measurement
Invasive	- Blood collection	Finger	Non-continuous sampling
Invasive (painless)	- Subcutaneous biosensor - Ionization - Microdialysis - Sonophoresis	Interstitial fluid	Continuous
Non-invasive	- Sweat, saliva, tears, urine	Body fluid	Non-continuous sampling
	- Raman spectroscopy - Optical coherence tomography - Polarization - Photoacoustic spectroscopy - Ultrasound - Impedance spectroscopy - Mid-infrared spectroscopy - Near-infrared spectroscopy	Skin	Non-continuous sampling

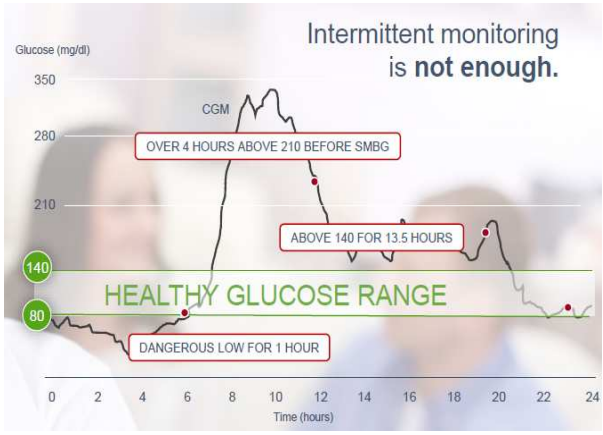
Source: Biotech Policy Research Center, Mirae Asset Daewoo Research

Figure 16. Conventional SMBG offers single-point blood glucose data



Source: Dexcom, Mirae Asset Daewoo Research

Figure 17. CGM offers continuous monitoring of glucose levels



Source: Dexcom, Mirae Asset Daewoo Research

CGM using thin wire subcutaneous sensors focuses on the fact that glucose moves between blood and interstitial fluid until it finds a balance. However, it normally takes five to ten minutes for blood and interstitial glucose levels to balance out. As such, to minimize error, CGM systems need to be calibrated every 12 hours with blood glucose readings. Dexcom's G5 was the first system to receive approval for use without calibration; other CGM systems require constant calibration.

Thin wire sensor CGM systems consist of a sensor, transmitter, and receiver. The sensor (single use with a lifespan of roughly two weeks) is inserted just below the skin to measure interstitial glucose levels. The transmitter (reusable with a lifespan of six to 12 months) wirelessly sends the interstitial glucose level data to the receiver. Once operational, a CGM system checks interstitial glucose levels every five minutes to monitor glucose level trends and patterns.

CGM accuracy is measured in terms of the mean absolute relative difference (MARD) of glucose levels in the interstitial fluid (vs. blood), with lower figures indicating higher levels of accuracy. CGM systems can be hooked up to insulin pumps to work as an artificial pancreas capable of automatically providing adequate levels of insulin according to changes in the patient's glucose levels.

Table 9. Dexcom's CGM products

Model	Pros	Cons	Note
G4	– 6-12 month lifespan – Supports Wi-Fi xDrip	– Transmitters are expensive – XDrip hardware needed at all times	– Calibration required every 12 hours
G5	– MARD: 9% – Provides Bluetooth connectivity between transmitter and smartphone without xDrip hardware – Can be used with G4 sensor and transmitter	– Offers Bluetooth connectivity – Does not support Wi-Fi Wixel – 3-month lifespan	– FDA approved for use without calibration

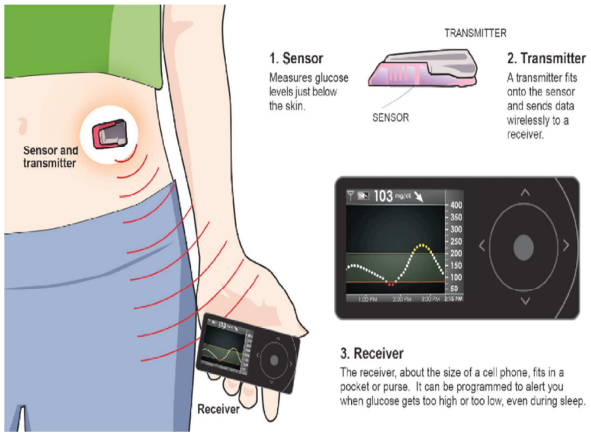
Source: Mirae Asset Daewoo Research

Table 10. CGM system comparisons

Company	Product	MARD	Sensor lifespan (days)	Transmitter price (US$)	Sensor price (US$)
Dexcom	G4	13%	21		
	G4 - 505 algorithm	9%	21		
	G5	9%	16	226	55
Medtronic	Veo with MiniLink	13%	7		
	640G with Guardian 2 (R1)	14%	10	425	55
	640G with Guardian 2 (R2)	9%	10		
Abbott	Freestyle Libre	11%	13		

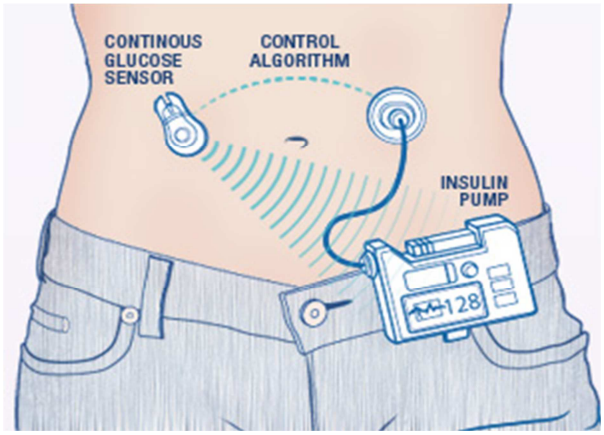
Source: Company data, Mirae Asset Daewoo Research

Figure 18. CGM systems



Source: Medimpact, Mirae Asset Daewoo Research

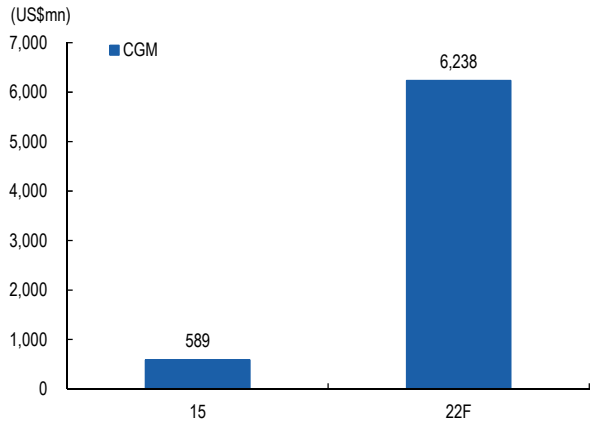
Figure 19. Artificial pancreas system



Source: Healthline, Mirae Asset Daewoo Research

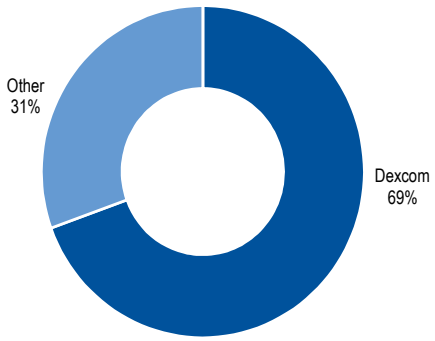
The size of the CGM market is estimated at W800bn as of 2016, and is expected to grow more than 40% per year to exceed W6tr by 2022. Dexcom, Medtronic, and Abbott currently offer thin wire sensor CGM systems, with Dexcom accounting for nearly 70% of the total market.

Figure 20. CGM market outlook



Source: Allied market research, Mirae Asset Daewoo Research

Figure 21. CGM market share



Source: Dexcom, Mirae Asset Daewoo Research

Figure 22. Sensor applicator

Source: Dexcom, Mirae Asset Daewoo Research

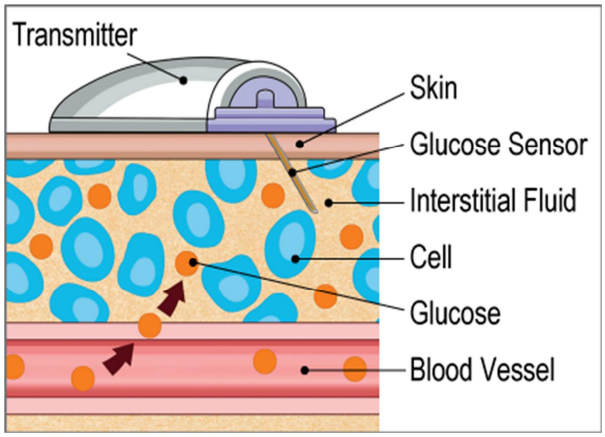
Figure 23. 13-14mm subcutaneous sensor measures glucose levels

Source: Animas, Mirae Asset Daewoo Research

Figure 24. Application of transmitter and sensor

Source: Dexcom, Mirae Asset Daewoo Research

Figure 25. Glucose levels monitored via interstitial fluid



Source: Medtronic, Mirae Asset Daewoo Research

5. Limits of CGM

CGM, unlike conventional SMBG, offers continuous blood glucose data. However, CGM has yet to fully replace SMBG due to the four issues covered below.

Price

The first issue is price, with CGM systems typically carrying a 30-50x higher price tag compared with conventional SMBG devices. SMBG meters normally cost W30,000-50,000 whereas CGM receivers cost nearly W1-1.5mn.

For patients with type 1 diabetes who need to measure glucose levels more than 10 times per day, SMBG costs around W100,000 for a four-week period (50 strips normally cost W20,000). As CGM requires at least two sensor replacements during the same period, total costs would reach around W200,000. In addition, a patient using CGM would need to replace his or her transmitter (W250,000-450,000) every six months.

For a full year, CGM would cost W1-1.5mn (fixed cost) for the receiver plus W3.1-3.5mn (variable cost) for transmitters and sensors. SMBG, on the other hand, would only cost W30,000-50,000 (fixed cost) for the initial meter purchase plus roughly W1.3mn (type 1 diabetes patients requiring more than 10 measurements per day) or W0.5mn (type 2 diabetes patients requiring four or less measurements per day) for strips. In sum, CGM systems cost nearly W3-4mn more than SMBG if used for one year.

We believe CGM will offer additional value above the incremental cost of W3-4mn per year to patients with life-threatening type 1 diabetes or insulin-dependent type 2 diabetes. However, for patients with non-insulin-dependent type 2 diabetes, CGM may not offer sufficient value.

Moreover, the incremental cost of W3-4mn could be a burden for patients in underdeveloped countries. In general, awareness and treatment of metabolic diseases remain limited in lower income brackets, as the diseases are not considered to be immediately life-threatening. For financially struggling patients, basic necessities are likely to be more important than pricey CGM systems.

As such, for CGM to fully replace conventional SMBG, purchase prices will need to fall from current levels. Technological innovations as well as economies of scale may drive a steady downtrend in prices. However, as patients with type 1 or insulin-dependent type 2 diabetes account for just 10-25% of all diabetics, CGM companies are unlikely to achieve economies of scale in the near term. Dexcom, which was established in 1999, is still recording net losses from CGM systems.

Table 11. SMBG and CGM price comparison

Company	Receiver/meter	Transmitter	Sensor/strips	Lifespan	Notes
Dexcom	US$1,200	US$226	US$88	10-14 days	US$350 for four sensors
Medtronic	US$1,400	US$425	US$50	10-14 days	
i-SENS	W30,000-50,000	-	W20,000/pack	Single use	50 strips per pack

Source: Company data, Mirae Asset Daewoo Research

Accuracy

Because CGM is still not as accurate as SMBG, it is mainly used for monitoring blood glucose trends, rather than exact glucose values. Over time, the accuracy of CGM is likely to improve, but there is still a great need for technological development.

One way to analyze the accuracy of blood glucose meters is Clark Error Grid analysis. Values in zones A and B are considered to be clinically significant, while values in zones C to E are considered less accurate. ISO quality standards require that 99% of the results fall within zones A and B.

Current SMBG devices are advanced enough in terms of technology and product stability that more than 95% of their readings fall within zone A. In the case of needle-type CGM systems (the most widely used type), however, only 50% of results fall within zone A and 95% within zones A and B. This suggests that more development is needed to enhance reliability.

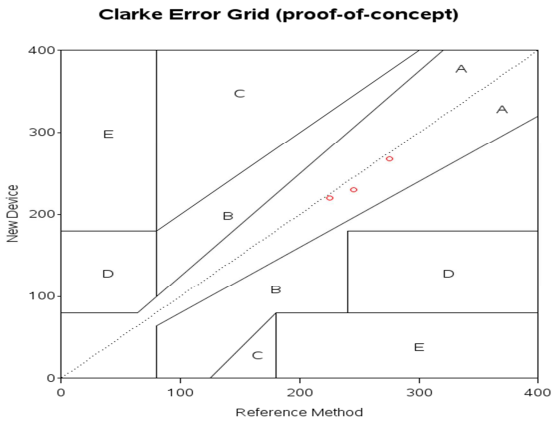
The relatively low accuracy of CGM systems is caused by the time lag between actual glucose levels and measured blood glucose levels. Needle-based CGM systems involve the measurement of glucose levels in the interstitial fluid. The problem is that it takes roughly 10 to 15 minutes for blood glucose and interstitial glucose to find equilibrium.

Another problem is that, as the needle stick is inserted under the skin, the CGM system comes into contact with a number of molecules (protein, ions, etc.) that could contaminate results. Therefore, CGM systems typically need to be calibrated at least once per day using an actual blood sample.

To address this issue, a wide range of meters based on Raman spectroscopy, photoacoustic technology, and heat/ultrasound technologies are currently under development. But given their levels of development compared to needle-type devices, it will take some time for such meters to actually hit the market.

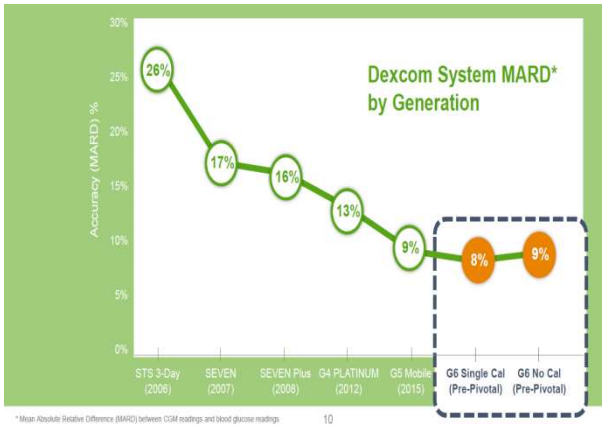
Blood glucose monitors are subject to very high international standards, and CGM systems need to meet the ISO15197:2013 standard for commercialization. Despite ongoing efforts to develop new types of CGM systems, it seems unlikely that meaningful technological advances (non-needle-based) will materialize anytime soon.

Figure 26. Clark Error Grid analysis; 99% of results must fall within zones A and B



Note: Values in zone A have the highest accuracy.
Source: SAS, Mirae Asset Daewoo Research

Figure 27. CGM MARD is 15% lower than ISO-certified MARD



Note: MARD refers to the difference between blood glucose and interstitial glucose levels. A lower MARD represents higher accuracy.
Source: Mirae Asset Daewoo Research

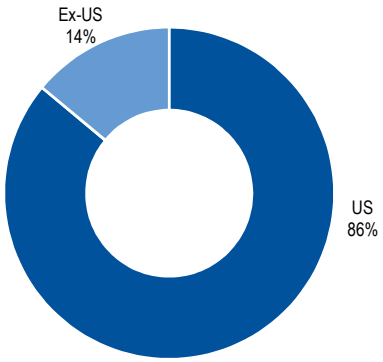
Regulations and side effects

Because CGM systems are categorized as new medical devices, their sale or use may be subject to regulations. In Korea, most CGM devices have yet to be approved, so patients who wish to use them have to import them from abroad and obtain personal-use medical device certificates.

Regulatory issues are likely to be resolved, but not in the short term. Due in large part to the fact that regulations differ by country, US firm Dexcom, which controls 70% of the CGM market, generates 86-87% of its sales domestically.

Another downside of CGM is its potential to cause skin problems. Keeping an ultra-thin needle under the skin for days tends to cause bruising, and the use of adhesives and pads to keep the sensors attached to the skin can lead to irritation.

Figure 28. Dexcom's sales by region



Source: Bloomberg, Mirae Asset Daewoo Research

Figure 29. Skin irritation caused by CGMS

Source: TuDiabetes, Mirae Asset Daewoo Research

Figure 30. Bruising caused by CGMS

Source: TuDiabetes, Mirae Asset Daewoo Research

6. Comparison between CGM suppliers and SMBG suppliers

Most global SMBG device manufacturers engage in both SMBG and in-vitro diagnostics. CGM is also part of the business portfolios of many large medical device suppliers. In comparing CGM to SMBG, we made i-SENS, which has relatively high exposure to SMBG, and Dexcom, the current market leader in CGM, our benchmarks.

In terms of revenue, Dexcom is four times larger than i-SENS. This is because CGM receivers are 30 times more expensive than SMBG meters, and because CGM sensors, which are purchased on a regular basis, are also expensive.

The COGS ratio for CGM systems is generally 10%p lower than that of SMBG devices, which we believe is due to business model differences. For SMBG, meters are sold at very thin margins, and profits are instead made by selling strips. For CGM systems, it is difficult to apply the same model, given the high price tag of the devices.

Dexcom is still making losses, as it has yet to achieve enough scale to cover its high SG&A expenses. The ratio of SG&A expenses to revenue stands at 77%, though the percentage has declined over the years. Revenue has grown materially, but needs to expand further in order for scale effects to kick in. We believe the company could begin to turn a profit in 2018 or 2019.

Table 12. i-SENS P&L statement (Wbn)

	10	11	12	13	14	15	16	Average
Revenue	37.8	52.2	66.5	82.9	95.6	101.9	132.5	
COGS	23.1	32.5	43.9	47.6	55.2	56.5	70.6	
% of revenue	*61.2%*	*62.2%*	*66.0%*	*57.5%*	*57.7%*	*55.5%*	*53.3%*	*59.1%*
SG&A	8.4	10.8	14.7	16.7	22.3	26.0	36.1	
% of revenue	*22.2%*	*20.6%*	*22.1%*	*20.1%*	*23.3%*	*25.5%*	*27.3%*	*23.0%*
R&D	3.6	5.2	6.3	8.5	9.8	11.8	12.7	
% of revenue	*9.5%*	*9.9%*	*9.5%*	*10.3%*	*10.2%*	*11.6%*	*9.6%*	*10.1%*
Operating profit	6.3	9.0	7.9	18.6	18.1	19.4	25.7	
OP margin	*16.6%*	*17.2%*	*11.9%*	*22.4%*	*19.0%*	*19.0%*	*19.4%*	*17.9%*

Source: Bloomberg, Mirae Asset Daewoo Research

Table 13. Dexcom P&L statement (US$mn)

	10	11	12	13	14	15	16	Average
Revenue	48.6	76.3	99.9	160.0	259.2	402.0	573.3	
COGS	30.2	40.44	53.3	59.9	82.9	123.6	194.9	
% of revenue	*62.1%*	*53.0%*	*53.4%*	*37.4%*	*32.0%*	*30.7%*	*34.0%*	*43.2%*
SG&A	63.7	80.66	101.7	126.5	202	335.5	442.3	
% of revenue	*131.1%*	*105.7%*	*101.8%*	*79.1%*	*77.9%*	*83.5%*	*77.1%*	*93.7%*
R&D	23.2	30.7	39.5	44.8	69.4	137.5	156.1	
% of revenue	*47.7%*	*40.2%*	*39.5%*	*28.0%*	*26.8%*	*34.2%*	*27.2%*	*34.8%*
Operating profit	-45.3	-44.8	-55.1	-26.4	-25.7	-57.1	-63.9	
OP margin	*-93.2%*	*-58.7%*	*-55.2%*	*-16.5%*	*-9.9%*	*-14.2%*	*-11.1%*	*-37.0%*

Source: Bloomberg, Mirae Asset Daewoo Research

7. Future of the blood glucose monitor market

The market for diabetes treatment should display steady growth, as the disease requires continuous monitoring and management.

In our view, concerns over a potential erosion of the SMBG market from the strong growth of the CGM market are overblown.

The vast majority of diabetes patients are non-insulin-dependent type 2 patients, and demand for CGM systems mostly comes from type 1 patients. CGM demand from non-insulin-dependent patients is unlikely to grow sharply until several issues (e.g., price, accuracy, regulations, undesirable side effects, etc.) are addressed.

Over the long term, CGM systems could eat into conventional SMBG demand, but the expansion should be limited to demand from type 1 and insulin-dependent type 2 patients.

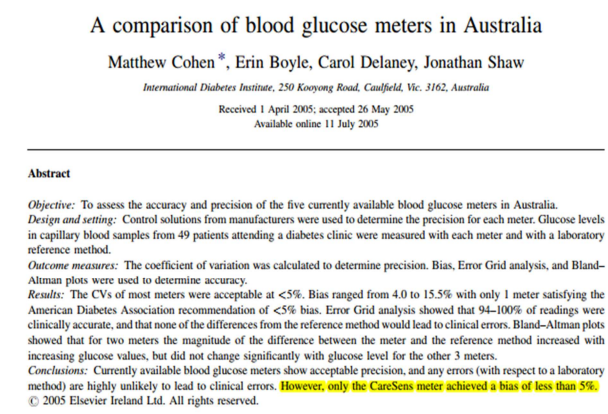
We retain our Buy call on i-SENS in light of stable ODM/OEM orders from global players, including Arkray and AgaMatrix. The company is anticipated to maintain robust growth momentum via the expansion of in-house brands and a steady increase in Chinese revenue.

In addition, as part of a government-funded project, i-SENS has been working on developing CGM systems since 2015. Clinical tests are scheduled for 2H17, with commercialization targeted for 2019-20.

In our view, the company has been able to strengthen its foothold in the already-oligopolistic blood glucose monitor market thanks to its technological competitiveness. CareSens, which the company introduced in 2003, measures blood glucose levels from a single drop of blood (0.5ml) within only five seconds, while rival products required 4ml of blood and 30 seconds. Indeed, a study by the International Diabetes Institute (Melbourne) in 2005 found CareSens to be the most accurate of the glucose monitors tested. In addition, thanks to the CareSens test strip, the company won the Frost & Sullivan Asia Pacific Excellence in Healthcare Award in 2009.

Moreover, the CareSens test strip received the highest score in an evaluation by the UK National Health Service (NHS) in December 2015. I-SENS currently supplies CareSens N and TEE2 test strips to its UK partner Spirit Healthcare.

Figure 31. Comparative study of blood glucose meters (1)



A comparison of blood glucose meters in Australia

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Abstract

Objective: To assess the accuracy and precision of the five currently available blood glucose meters in Australia.
Design and setting: Control solutions from manufacturers were used to determine the precision for each meter. Glucose levels in capillary blood samples from 49 patients attending a diabetes clinic were measured with each meter and with a laboratory reference method.
Outcome measures: The coefficient of variation was calculated to determine precision. Bias, Error Grid analysis, and Bland–Altman plots were used to determine accuracy.
Results: The CVs of most meters were acceptable at <5%. Bias ranged from 4.0 to 15.5% with only 1 meter satisfying the American Diabetes Association recommendation of <5% bias. Error Grid analysis showed that 94–100% of readings were clinically accurate, and that none of the differences from the reference method would lead to clinical errors. Bland–Altman plots showed that for two meters the magnitude of the difference between the meter and the reference method increased with increasing glucose values, but did not change significantly with glucose level for the other 3 meters.
Conclusions: Currently available blood glucose meters show acceptable precision, and any errors (with respect to a laboratory method) are highly unlikely to lead to clinical errors. However, only the CareSens meter achieved a bias of less than 5%.

Note: Only CareSens achieved a bias of less than 5%
Source: Diabetes Research and Clinical Practice, Mirae Asset Daewoo Research

Figure 32. Comparative study of blood glucose meters (1)

Table 2
Comparison of blood glucose concentrations in 49 patients obtained by glucose meters and reference method (YSI)

Reference/glucose meter	Glucose concentration (mmol/l). Mean (S.D.)	Bias (%)	Regression equation
YSI (reference)	8.933 (3.886)		
Optium	9.533 (3.91)	6.7	$y = 0.99x + 0.67$
Accu-Chek Go	9.619 (4.16)	7.7	$y = 1.06x + 0.12$
CareSens	9.288 (3.70)	4.0	$y = 0.93x + 0.95$
Accu-Chek Advantage	9.510 (4.06)	6.5	$y = 1.03x + 0.29$
GlucoMen	10.317 (4.52)	15.5	$y = 1.15x + 0.03$

y, glucose meter; x, YSI (reference). Regression equations were calculated from paired values obtained from the reference method and each glucose meter.

Note: Only CareSens achieved a bias of less than 5%
Source: Diabetes Research and Clinical Practice, Mirae Asset Daewoo Research

Table 14. Blood glucose test strip evaluation results

Producer	Test strip	Cost per 50 strips (GBP)	Score (out of 50)
Abbott	FreeStyle Lite	15.8	43.4
	FreeStyle Optium	15.7	43.4
Bayer	Contour Next	15.04	42.7
GlucoRx	GlucoRx Nexus	9.95	45
LifeScan	OneTouch Verio	15.12	42.6
	OneTouch Select Plus	9.99	42
Menarini Diagnostics	GlucoMen Areo	9.95	45
	GlucoMen LX	15.52	42.5
Neon Diagnostics	Element	9.89	44.1
	GluNeo	9.89	44.1
Nipro Diagnostics	TRUEyou	9.92	42
Roche	Aviva	15.79	42.4
	Active	9.95	44
	Performa	9.95	45
	Mobile	15.95	41.3
Sanofi	BGStar	14.73	39.7
Spirit Healthcare	**CareSens N**	**12.75**	**44.5**
	TEE2	**7.75**	**48**
Ypsome	Mylife Pura	9.5	43.4
	Mylife Unio	9.5	40.4

Note: I-SENS supplies its products to Sanofi (strips via a US partner) and Spirit Healthcare (both meters and strips).
Source: NHS, Mirae Asset Daewoo Research

i-SENS (099190 KQ/Buy/TP: W40,000)

Comprehensive Income Statement (Summarized)

(Wbn)	12/16	12/17F	12/18F	12/19F
Revenue	**132**	**162**	**184**	**214**
Cost of Sales	**71**	**89**	**100**	**116**
Gross Profit	**61**	**73**	**84**	**98**
SG&A Expenses	**36**	**44**	**48**	**56**
Operating Profit (Adj)	**26**	**29**	**36**	**42**
Operating Profit	**26**	**29**	**36**	**42**
Non-Operating Profit	**-3**	**-3**	**-2**	**-1**
Net Financial Income	-1	-1	-1	-1
Net Gain from Inv in Associates	-2	-1	0	0
Pretax Profit	23	26	34	41
Income Tax	5	6	7	9
Profit from Continuing Operations	18	19	27	32
Profit from Discontinued Operations	0	0	0	0
Net Profit	18	19	27	32
Controlling Interests	18	20	27	32
Non-Controlling Interests	0	0	0	0
Total Comprehensive Profit	**17**	**17**	**27**	**32**
Controlling Interests	17	698	1,086	1,277
Non-Controlling Interests	0	-681	-1,059	-1,245
EBITDA	32	37	43	48
FCF (Free Cash Flow)	4	19	29	29
EBITDA Margin (%)	24.2	22.8	23.4	22.4
Operating Profit Margin (%)	19.7	17.9	19.6	19.6
Net Profit Margin (%)	13.6	12.3	14.7	15.0

Statement of Financial Condition (Summarized)

(Wbn)	12/16	12/17F	12/18F	12/19F
Current Assets	**95**	**120**	**155**	**197**
Cash and Cash Equivalents	26	37	64	89
AR & Other Receivables	34	41	45	53
Inventories	32	38	42	49
Other Current Assets	3	4	4	6
Non-Current Assets	**123**	**118**	**112**	**107**
Investments in Associates	3	4	4	5
Property, Plant and Equipment	81	76	71	67
Intangible Assets	24	20	18	17
Total Assets	**218**	**238**	**267**	**304**
Current Liabilities	**32**	**36**	**38**	**43**
AP & Other Payables	14	16	18	21
Short-Term Financial Liabilities	13	12	12	12
Other Current Liabilities	5	8	8	10
Non-Current Liabilities	**31**	**30**	**31**	**32**
Long-Term Financial Liabilities	24	22	22	22
Other Non-Current Liabilities	7	8	9	10
Total Liabilities	**63**	**66**	**69**	**75**
Controlling Interests	**149**	**168**	**194**	**224**
Capital Stock	7	7	7	7
Capital Surplus	45	45	45	45
Retained Earnings	97	117	143	173
Non-Controlling Interests	**5**	**4**	**4**	**4**
Stockholders' Equity	**154**	**172**	**198**	**228**

Cash Flows (Summarized)

(Wbn)	12/16	12/17F	12/18F	12/19F
Cash Flows from Op Activities	12	21	29	29
Net Profit	18	19	27	32
Non-Cash Income and Expense	13	17	15	16
Depreciation	5	5	5	5
Amortization	1	2	2	2
Others	7	10	8	9
Chg in Working Capital	-17	-8	-5	-9
Chg in AR & Other Receivables	-9	-43	-4	-8
Chg in Inventories	-9	-6	-4	-7
Chg in AP & Other Payables	3	-1	1	1
Income Tax Paid	**-6**	**-7**	**-7**	**-9**
Cash Flows from Inv Activities	-14	-6	-1	-1
Chg in PP&E	-8	-2	0	0
Chg in Intangible Assets	-1	0	0	0
Chg in Financial Assets	5	-1	-1	-1
Others	**-10**	**-3**	**0**	**0**
Cash Flows from Fin Activities	4	-1	-1	-1
Chg in Financial Liabilities	8	-3	0	0
Chg in Equity	0	0	0	0
Dividends Paid	0	0	-1	-1
Others	**-4**	**2**	**0**	**0**
Increase (Decrease) in Cash	2	12	26	26
Beginning Balance	23	26	37	63
Ending Balance	**26**	**37**	**63**	**89**

Forecasts/Valuations (Summarized)

	12/16	12/17F	12/18F	12/19F
P/E (x)	23.0	18.3	13.3	11.3
P/CF (x)	13.3	10.0	8.5	7.5
P/B (x)	2.7	2.2	1.9	1.6
EV/EBITDA (x)	13.2	9.8	7.8	6.4
EPS (W)	1,280	1,443	1,979	2,327
CFPS (W)	2,211	2,648	3,108	3,526
BPS (W)	10,911	12,230	14,110	16,336
DPS (W)	100	100	100	100
Payout ratio (%)	7.8	7.1	5.0	4.3
Dividend Yield (%)	0.3	0.4	0.4	0.4
Revenue Growth (%)	29.4	22.7	13.6	16.3
EBITDA Growth (%)	18.5	15.6	16.2	11.6
Operating Profit Growth (%)	36.8	11.5	24.1	16.7
EPS Growth (%)	18.8	12.7	37.1	17.6
Accounts Receivable Turnover (x)	4.7	4.5	4.5	4.5
Inventory Turnover (x)	5.0	4.7	4.7	4.7
Accounts Payable Turnover (x)	14.3	14.9	14.7	14.9
ROA (%)	8.8	8.5	10.8	11.2
ROE (%)	12.5	12.5	15.0	15.3
ROIC (%)	14.8	13.9	17.7	20.6
Liability to Equity Ratio (%)	40.9	38.2	34.9	32.9
Current Ratio (%)	294.8	335.4	405.2	459.0
Net Debt to Equity Ratio (%)	5.9	-3.2	-16.2	-25.5
Interest Coverage Ratio (x)	32.3	27.8	34.3	40.3

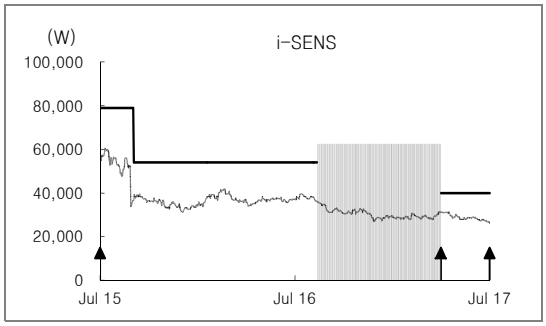
Source: Company data, Mirae Asset Daewoo Research estimates

APPENDIX 1

Important Disclosures & Disclaimers

2-Year Rating and Target Price History

Company (Code)	Date	Rating	Target Price
i-SENS (099190)	04/11/2017	Buy	40,000
		No Coverage	
	09/13/2015	Buy	54,000
	06/22/2015	Buy	79,000



Stock Ratings		Industry Ratings	
Buy	: Relative performance of 20% or greater	Overweight	: Fundamentals are favorable or improving
Trading Buy	: Relative performance of 10% or greater, but with volatility	Neutral	: Fundamentals are steady without any material changes
Hold	: Relative performance of -10% and 10%	Underweight	: Fundamentals are unfavorable or worsening
Sell	: Relative performance of -10%		

Ratings and Target Price History (Share price (—), Target price (▬), Not covered (■), Buy (▲), Trading Buy (■), Hold (●), Sell (◆))

* Our investment rating is a guide to the relative return of the stock versus the market over the next 12 months.
* Although it is not part of the official ratings at Mirae Asset Daewoo Co., Ltd., we may call a trading opportunity in case there is a technical or short-term material development.
* The target price was determined by the research analyst through valuation methods discussed in this report, in part based on the analyst's estimate of future earnings.
* The achievement of the target price may be impeded by risks related to the subject securities and companies, as well as general market and economic conditions.

Equity Ratings Distribution

Buy	Trading Buy	Hold	Sell
69.67%	17.06%	13.27%	0.00%

* Based on recommendations in the last 12-months (as of June 30, 2017)

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