

Diabetes

Updated survey on insulin pumps and continuous glucose monitoring

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Disclaimer & Disclosures.

This report must be read with the disclosures and the analyst certifications in the Disclosure appendix, and with the Disclaimer, that form part of it.

- ▶ **About 280 insulin pump users responded to our June 2007 insulin pump and continuous glucose monitoring (CGM) survey; this report summarizes our observations**
- ▶ **In our view, these results confirm the large market opportunity for real-time continuous glucose monitoring; Medtronic's Guardian and DexCom's STS CGMs are currently available in the US, while Abbott's Navigator CGM is awaiting FDA approval**
- ▶ **These results also highlight the opportunity for new insulin pump technologies, such as MDT's Paradigm insulin pump, which is integrated with its Guardian CGM and Insulet's disposable, tubeless insulin pump**

In November 2005, we published a survey of 300+ insulin pumpers that supported our estimates for mid-teens annual growth in the worldwide insulin pump market through 2009, and confirmed the market opportunity for real-time continuous glucose monitors.

The results from our new June 2007 survey, which we summarize in this note, give us increased confidence that the CGM market opportunity is large and addressable, particularly when these devices become more broadly reimbursed by third-party payers. We continue to forecast c140,000 CGM users in the US by end-2009 (compared to about 15,000 today). We view this as positive news for the CGM manufacturers - Medtronic, DexCom, and Abbott. Our updated CGM model can be found in our separate 3 July 2007 industry note, *MDT, DXCM: Takeaways from the ADA conference and our proprietary June diabetes survey*.

Medtronic's Paradigm insulin pump, when integrated with its Guardian CGM, provides the company a competitive advantage in both the pump and CGM markets. We would view a partnership between DexCom and any of the leading insulin pump manufacturers as a positive for both parties to better compete with Medtronic in their respective markets.

HSBC Healthcare Equipment & Supplies: Company valuation summary (USD)

Ticker	BCR	BSX	DXCM	ISRG	MDT	POSS	STJ	STXS	THOR
Company name	C.R. Bard	Boston Scientific	DexCom	Intuitive Surgical	Medtronic	Possis Medical	St. Jude Medical	Stereotaxis	Thoratec
Current price (06/28/07 close)	82.4	15.5	8.0	138.5	51.8	11.0	41.4	12.8	18.8
Market capitalization (USDbn)	8.5	23.0	0.2	5.2	59.1	0.2	14.0	0.5	1.0
Price target	96	17	10	146	55	12	48	16	23
Rating	Overweight	Neutral	Overweight (V)	Overweight (V)	Neutral	Neutral (V)	Overweight	Overweight (V)	Overweight (V)
Fiscal year ends	Dec	Dec	Dec	Dec	April	July	Dec	Dec	Dec
EPS include FAS No. 123?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
EPS FY 2005	3.03	1.82	-3.38	2.51	1.86	0.33	1.54	-1.60	0.45
EPS FY 2006	3.30	0.81	-1.71	1.89	2.21	0.21	1.51	-1.39	0.38
EPS FY 2007	3.81e	0.42e	-1.53e	2.85e	2.41	0.02e	1.75e	-1.02e	0.36e
EPS FY 2008	4.37e	0.68e	-1.20e	3.70e	2.70e	0.13e	2.05e	-0.44e	0.51e
EPS FY 2009	5.03e	0.86e	-0.40e	4.71e	3.04e	0.25e	2.35e	0.19e	0.69e
P/E - FY2005	27.2x	8.5x	-	55.2x	27.8x	33.2x	26.9x	-	41.8x
P/E - FY2006	25.0x	19.1x	-	73.3x	23.4x	52.2x	27.4x	-	49.5x
P/E - FY2007	21.6x	36.9x	-	48.6x	21.5x	548.5x	23.7x	-	52.2x
P/E - FY2008	18.9x	22.8x	-	37.4x	19.2x	84.4x	20.2x	-	36.9x
P/E - FY2009	16.4x	18.0x	-	29.4x	17.0x	43.9x	17.6x	67.5x	27.2x

Source: Company reports, HSBC

Diabetes survey

- ▶ About 280 insulin pump users responded to our survey
- ▶ Strong demand for continuous glucose monitoring (CGM)
- ▶ Enthusiasm for insulin pumps integrated with CGM

Summary

According to Medtronic, the US market leader in diabetes insulin pumps, c28% or 320,000 of the 1.1m people with Type 1 diabetes in the US are using insulin pumps to deliver insulin. We estimate c75% of the current US insulin pump installed base is using a Medtronic MiniMed insulin pump.

The launches of the first and second generation continuous glucose monitors (CGMs) by Medtronic and DexCom have been welcomed by a number of early adopters - an estimated 15,000 users as of June 2007, but we believe lack of broad third-party payer reimbursement for the upfront USD800-1,300 system cost and the USD8-12 per day sensor cost has been a large barrier to increasing adoption.

In November 2005, we published a survey of 300+ insulin pumpers which supported our estimates for mid-teens annual growth in the worldwide insulin pump market through 2009, and confirmed the market opportunity for real-time continuous glucose monitors (see our 29 November 2005 report, *Diabetes: Proprietary survey on insulin pumps and continuous blood glucose monitoring*).

The results from our June 2007 survey, which we summarize in this note, give us increased confidence that the CGM market opportunity is

large and addressable, particularly when these devices become more broadly reimbursed by third-party payers. We continue to forecast c140,000 CGM users in the US by end-2009 (compared to about 15,000 today). We view this as positive news for the CGM manufacturers - Medtronic, DexCom and Abbott.

The June 2007 survey also highlights the patient enthusiasm for Medtronic's Paradigm insulin pump integrated with the Guardian CGM. We believe this bodes well for Medtronic's goal of growing its diabetes division at a 15-17% CAGR over the next five years, as this integration provides the company with a competitive advantage in both the pump and CGM markets.

Catalysts for CGM market growth include: the recent introductions of next generation CGM devices by Medtronic and DexCom, the pending entrance of Abbott (its CGM device is currently under FDA review), which should help drive physician and patient awareness and interest in CGM devices, publication of additional data demonstrating improvements in glucose control in select, motivated patients from CGM, and the completion of the enrollment of a randomized, 450-patient CGM trial sponsored by the Juvenile Diabetes Research Foundation (JDRF) in the October 2007 timeframe. We believe the 12-month follow-up data will support broad reimbursement by end-2008. In the interim before

broad reimbursement, JDRF reported that more than 75 health plans provide CGM coverage on a case-by-case basis; but overall insurers are looking for more clinical evidence to support coverage.

Diabetes background

According to the International Diabetes Federation (IDF; www.idf.org), more than 246m people worldwide have diabetes. The countries with the largest number of people with diabetes include India (41m), China (40m), the US (19m), Russia (10m), and Germany (7m).

The American Diabetes Association (ADA; www.diabetes.org) estimates that about 21m people in the US have diabetes, an estimated 15m of whom have been diagnosed with diabetes. Of these 15m, about 5-10% have Type 1 insulin-dependent diabetes requiring daily insulin injections. The remaining 90-95% have insulin resistant/deficient Type 2 diabetes.

The Diabetes Control and Complications Trial (DCCT) demonstrated that intensive insulin therapy – multiple (three or more) daily injections (i.e., shots with syringe or insulin pen) of insulin (MDI) or insulin pump therapy – keeps blood sugar/glucose levels in a normal versus elevated (hyperglycemia) range, and slows the progression of diabetic retinopathy, nephropathy, and neuropathy in Type 1 diabetics; at the expense of increased severe hypoglycemia (low blood sugar from too much insulin or too little glucose in the blood). The incidence of severe hypoglycemia in the trial, defined as treatment requiring assistance, was approximately three times higher in the intensive therapy group, and included altered consciousness, episodes of coma/seizure, and hospital/emergency room visits.

The ADA recommends that diabetics measure their blood glucose levels four or more times a day using finger capillary blood glucose

measurements (i.e., fingersticks). Hypoglycemia remains an obstacle for many diabetics, despite frequent blood glucose measurements. Although some diabetics are aware of symptoms of hypoglycemia (i.e., shakiness, sweating, hunger, sudden moodiness, and tingling sensations around the mouth), others have hypoglycemia unawareness.

It is widely estimated that about 10-20% of Type 1 diabetics have hypoglycemia unawareness, and this has been reported in up to 50% of people with Type 1 diabetes.

In addition, Type 1 diabetics, on average, have two episodes of symptomatic hypoglycemia per week and an episode of severe, at least temporarily disabling, hypoglycemia about once a year (*Diabetes Care*, 26:1902-1912, 2003). Therefore, the benefit of decreased long-term complications from intensive therapy may be less favorable for those diabetics with frequent incidences of severe hypoglycemia or hypoglycemia unawareness.

Insulin pumps

Insulin pumps are an alternative to daily injections and provide some diabetics better control of their diabetes and a more flexible lifestyle. The standard insulin pump is about the size of a pager and is worn outside the body. The pump is programmed to deliver insulin continuously (basal rate) and in specific increments (bolus) when needed. An infusion set consists of a thin, plastic tube through which insulin is delivered from the pump to the pump user. Infusion sets are inserted just beneath the skin, and are changed, on average, every two to four days. Insulin pump users fill up a new insulin cartridge, which is placed inside the pump, about every 8-10 days (depending on cartridge size and daily insulin usage). Most third-party payers allow diabetics to upgrade to a new pump every four years.

Medtronic's MiniMed division (acquired in August 2001) is the insulin pump market leader in the US, while Roche's Disetronic division (acquired in May 2003) is the market leader outside of the US. Until 2000, the US insulin pump and disposables market was dominated by MiniMed and Disetronic. Medtronic received FDA approval for its latest Paradigm Real-Time system, which combines its Paradigm insulin pump with its Guardian CGM, in April 2006. In June 2003, Roche stopped shipping insulin pumps to the US, as a result of regulatory issues with the FDA, while continuing to support its installed customer base in terms of customer support and shipping of disposables. Roche re-entered the US market with its Accu-Chek Spirit after the import alert was lifted in October 2006.

Animas, acquired by Johnson & Johnson in February 2005, began shipping insulin pumps in 2000 and introduced its latest 2020 pump in April 2007. Deltec introduced the Cozmo insulin pump in December 2002 and partnered with Abbott to introduce its new CozMore Insulin Pump System in August 2004, which works with the Abbott FreeStyle single-point blood glucose meter. Sooil (Dana Diabecare pump) and Nipro (Amigo pump) also manufacture insulin pumps.

In 2005, Insulet started selling its disposable OmniPod insulin delivery system and the company has about 1,750 customers as of March 2007. Relative to traditional pumps, we believe the OmniPod is easier to use, does not require tubing that may kink and interfere with insulin delivery, and has a shorter learning curve for both physicians and diabetics. The system consists of the pod itself, which is worn for up to three days and a personal diabetes manager, which is a wireless, handheld device that programs the pod and incorporates an Abbott FreeStyle blood glucose meter. The cost structure for OmniPod (USD800 upfront and USD345 per month versus

USD5,000-6,000 upfront plus USD1,500 per year for infusion/tubing sets for traditional pumps) may also reduce the cost barrier for potential candidates.

Continuous glucose monitors

Continuous glucose monitors deliver real-time blood glucose levels, have hypo/hyperglycemia alerts, and display/store blood glucose trend data and graphs, without the need to continuously take single-point fingerstick measurements from traditional/episodic blood glucose meters (the market leaders are Roche, Johnson & Johnson, Abbott, and Bayer).

The use of CGMs provides additional information that for some diabetics results in: improved glycemic control – i.e., lower HbA1c levels (normal is between 3.5% and 5.5%; a healthy goal for diabetics is under 7%), or greater time spent in the normal A1c range; fewer hypoglycemic episodes; and a lower rate of long-term complications from diabetes.

Three real-time continuous glucose monitors are currently approved by the FDA: the non-invasive GlucoWatch G2 available from Johnson & Johnson (following the Animas acquisition; the monitor is not actively promoted by Johnson & Johnson), Medtronic's Guardian REAL-Time, and DexCom's STS; the 3-day STS will eventually be obsolete by the 7-day STS (SEVEN) system approved by the FDA in May. Abbott's FreeStyle Navigator CGM system is currently awaiting FDA approval.

The key components of the three minimally invasive systems – Guardian, STS and Navigator – include: a sensor that is inserted just under the skin (which is replaced every three or seven days for STS, three days for the Guardian, and five days for Navigator) and that is held in place on the abdomen/arm with adhesive, a hand-held pager-size monitor/receiver, and a transmitter that

transfers the blood glucose measurements from the sensor to the monitor/receiver. The sensor and transmitter are integrated into one component when worn on the body.

The Children with Diabetes website provides a detailed comparison of Medtronic's Paradigm Real-Time system and Guardian Real-Time CGM, DexCom's STS CGM, and Abbott's FreeStyle Navigator CGM:

<http://www.childrenwithdiabetes.com/continuous.htm>.

Single-point fingerstick measurements are still necessary, both to calibrate the CGM sensors prior to and during use and to confirm any CGM hypo/hyperglycemic readings that require the patient to take some action.

Johnson & Johnson's Lifescan diabetes division is developing a minimally-invasive CGM system, as discussed at its September 2006 analyst meeting. Also last September, Becton Dickinson announced that it was developing a CGM internally through the clinical evaluation milestone, and that the company would most likely seek to work with a partner to market the device. Neither Roche nor Bayer has broadly discussed with the investment community plans to develop and launch a real-time CGM (although Bayer has a relationship with Sontra Medical, which is developing a CGM for hospital use).

Survey background

Insulin Pumpers (<http://www.insulin-pumpers.org>) provides support and information for people with diabetes. About 280 of the c5,000 insulin pump users worldwide in the Insulin Pumpers organization responded to our insulin pump survey in June 2007. This report summarizes our observations of the results.

For further details, the summary and individual responses can be viewed at:

http://www.surveymonkey.com/sr.aspx?sm=tZH_

2bmikETBDRktoUpJqETcg7JgpvWgyA2fMtpI40qRU_3d.

Survey questions

1. Age of insulin pump user (choose from list)
2. Type diabetes: I, II, Other
3. Which insulin pump are you currently using (choose from list)
4. Is this your first pump: Yes, No
5. If this is NOT your first pump, please list your previous insulin pump (choose from list)
6. On a scale of 1 to 10 (10 being the best), please rate the customer service of your current pump manufacture
7. How would you rate the customer service of your current pump manufacturer in 2007 to date, relative to 2006: Significantly worse, worse, same, better, significantly better
8. In question #5, if you have switched to a different pump manufacturer, please rate the customer service of your prior pump manufacturer on a scale of 1 to 10 (10 being the best)
9. Which three feature(s) do you like best about your current insulin pump?
10. Which three feature(s) about your current insulin pump do you wish could be improved?
11. Would you recommend your current insulin pump to others considering insulin pump therapy: Yes, No, Maybe
12. Are you considering switching to an insulin pump made by a different manufacturer: Yes, No, Maybe
13. If you answered Yes/Maybe to #12, which pump manufacturer(s) are you interested in switching to and why

14. Would you consider switching from your current insulin pump to the OmniPod
15. Referring to the prior OmniPod question, why or why not
16. If you are currently using Insulet's OmniPod, on a scale of 1-10 (10 being the most satisfied), how satisfied are you with the OmniPod
17. If you are currently using Insulet's OmniPod, what are the key reasons why you like OmniPod
18. If you are currently using Insulet's OmniPod, what features do you wish could be improved or changed
19. Would you consider using inhaled insulin
20. Referring to the prior inhaled insulin question, why or why not
21. Number of times on average you test your blood sugar daily
22. Are you interested in wearing any of the following external continuous glucose monitors: GlucoWatch, DexCom STS, Medtronic Guardian RT/Real-Time, Abbott FreeStyle Navigator
23. Please explain why you are, or are not, interested in continuous glucose monitoring
24. What are your top reasons for being interested in the particular continuous glucose device(s) specified in Question 22
25. Have you at any point tried using any of the following external continuous glucose monitors: GlucoWatch, DexCom STS, Medtronic Guardian RT/Real-Time, Abbott FreeStyle Navigator
26. Are you currently using any of the following external continuous glucose monitors: GlucoWatch, DexCom STS, Medtronic Guardian RT/Real-Time, Abbott FreeStyle Navigator

27. If you are currently using a continuous glucose monitor, how often and at what times are you using sensors

28. On a scale of 1-5 (5 being the best), please rate the following characteristics for the applicable [CGM] device (s) you have experience with: Overall satisfaction, Accuracy/reliability, Ease of user, Size/comfort, Customer support from manufacturer

29. If you are currently using a continuous glucose monitor (CGM), are you paying out of pocket for your current continuous glucose monitoring sensors

30. How important are the following advances in continuous glucose monitoring (CGM):
Improvements in current FDA-approved CGM devices, New CGM manufacturers receiving FDA approval, More affordable CGM devices/sensors, Reimbursement for CGM devices/sensors, Additional clinical data with CGM, More users to report their experiences with CGM, My doctor/CDE to recommend CGM, FDA approval for CGM as a stand-alone device (no confirmatory fingersticks), More integration of CGM with insulin pumps, Non-invasive CGM devices

Respondent demographics

In total, 282 insulin pumpers (or parents of insulin pumpers) participated in our 30-question diabetes survey. As a few respondents skipped certain questions, stated percentages are calculated based on the number of responses for each particular question.

A majority or 41% of the insulin pumpers responding to our survey are between 41 and 60 years of age; 11% are 18 and under, 32% between 19 and 40 years, and 15% are 61 or over. About 95% have Type 1 diabetes (including those considering themselves in between Type 1 and Type 2) and 5% have Type 2 diabetes.

HSBC diabetes survey, June 2007: Age of insulin pump user

	Number	Percent
All	279	100%
18 and under	32	11%
19-40	90	32%
41-60	115	41%
61 and over	42	15%

Source: HSBC survey

Insulin pump use

The breakdown of pump manufacturer is as follows: 147 or 52% using MiniMed (Medtronic), 63 or 22% using Animas (Johnson & Johnson), 46 or 16% using Deltec's Cozmo (Smiths Group; pump-meter system developed with Abbott), 18 or 6% using Disetronic (Roche), 7 or 2% using Insulet's OmniPod, and one person using Nipro's Amigo. No Sooil (Dana Diabecare) pumpers responded.

HSBC diabetes survey, June 2007: Current insulin pump manufacturer

	Number	Percent
All	282	100%
Animas/JNJ	63	22%
Dana/Sooil	0	0%
Deltec/Smiths	46	16%
Disetronic/Roche	18	6%
Insulet	7	2%
MiniMed/Medtronic	147	52%
Nipro	1	0%

Source: HSBC survey

For c35% or 97 of the respondents, their current pump was their first pump. For those on their first insulin pump, 47% (n=46) chose a MiniMed pump, 21% (n=20) chose a Deltec pump, 20% (n=19) chose an Animas pump, 8% (n=8) chose a Disetronic pump, and 4% (n=4) chose Insulet.

For the remaining 65% or 184 that have switched to a different insulin pump, sometimes from the same manufacturer, 54% (n=100) switched to a MiniMed pump, 24% (n=44) switched to an Animas pump, 14% (n=26) switched to a Deltec pump, 5% (n=10) switched to a Disetronic pump, 2% (n=3) switched to Insulet, and 1% (n=1) switched to Nipro.

HSBC diabetes survey, June 2007: Insulin pumpers on their first pump

Current pump manufacturer	Number	Percent
All	97	100%
Animas/JNJ	19	20%
Dana/Sooil	0	0%
Deltec/Smiths	20	21%
Disetronic/Roche	8	8%
Insulet	4	4%
MiniMed/Medtronic	46	47%
Nipro	0	0%

Source: HSBC survey

HSBC diabetes survey, June 2007: Insulin pumpers that have switched to a different pump

Current pump manufacturer	Number	Percent
All	184	100%
Animas/JNJ	44	24%
Dana/Sooil	0	0%
Deltec/Smiths	26	14%
Disetronic/Roche	10	5%
Insulet	3	2%
MiniMed/Medtronic	100	54%
Nipro	1	1%

Source: HSBC survey

Of the 184 that have switched to a different insulin pump, 70% (n=128) were previously using a MiniMed pump, 15% (n=27) were on a Disetronic pump, 11% (n=20) were on an Animas pump, 4% (n=7) were on a Deltec pump, and 1% (n=2) was on a Dana pump.

For MiniMed pumpers on a prior pump (n=100), 86% were on a MiniMed pump, 7% were on a Disetronic pump, 4% were on a Deltec pump, and 3% used a Dana/Animas pump. For Animas pumpers on a prior pump (n=44), 45% were on a MiniMed pump, 34% were on an Animas pump, 18% were on a Disetronic pump, and 2% were on a Dana pump. For Deltec pumpers on a prior pump (n=26), 65% were on a MiniMed pump, 19% were on a Disetronic pump, 12% were on an Animas pump, and 4% were on a Deltec pump. For Disetronic pumpers on a prior pump (n=10), 70% were on a Disetronic pump and 30% were on a MiniMed pump. For Insulet pumpers on a prior pump (n=3), two were on a Deltec pump and one

HSBC diabetes survey, June 2007: Insulin pumpers that switched to a different pump

Current pump manufacturer	Prior pump manufacturer				
	MiniMed/Medtronic	Disetronic/Roche	Deltec/Smiths	Dana/Sooil	Animas/JNJ
All (n=184)	70%	15%	4%	1%	11%
MiniMed/Medtronic (n=100)	86%	7%	4%	1%	2%
Animas/JNJ (n=44)	45%	18%	0%	2%	34%
Deltec/Smiths (n=26)	65%	19%	4%	0%	12%
Disetronic/Roche (n=10)	30%	70%	0%	0%	0%
Insulet (n=3)	33%	0%	67%	0%	0%
Nipro (n=1)	100%	0%	0%	0%	0%

Source: HSBC survey

was on a MiniMed pump. The current sole Nipro pumper was previously on a MiniMed pump.

Customer service

HSBC diabetes survey, June 2007: Customer service of current pump manufacturer (10 being the best)

Current pump manufacturer	Rating
All	8.4
Animas/JNJ	8.8
Deltec/Smiths	8.7
Disetronic/Roche	7.9
Insulet	9.0
MiniMed/Medtronic	8.2
Nipro	8.0

Source: HSBC survey

We asked pumpers to rate the customer service of their current pump manufacturer (10 being the best). Across all manufacturers, customer service was very good, with average manufacturer ratings ranging from 7.9 to 9.0, versus an overall average of 8.4. By manufacturer, the results looked relatively consistent (keeping in mind the Disetronic and Insulet subsets are small), with Insulet, Animas, and Deltec scoring the above the overall average.

We asked pumpers to rate the customer service of their current pump manufacturer in 2007 to date, relative to 2006, if applicable. Overall, 78% of pumpers rated service as same, while 13% rated service as better and 9% rated service as worse. For MiniMed, 76% rated service as same, 13% rated service as better, and 11% rated service as worse. For Animas, 89% rated service as same, 7% rated service as better, and 4% rated service as worse. For Deltec, 69% rated service as same, 22% rated service as better, and 8% rated service as worse. For Disetronic, 73% rated service as same, 7% rated service as better, and 20% rated service as worse. For Insulet, 71% rated service as same and 29% rated service as better.

We also asked pumpers to rate the customer service of their prior pump manufacturer. Pumpers previously on Animas, Disetronic, Deltec, MiniMed and Dana rated the customer service on average at 7.8, 7.5, 7.3, 5.1, and 4.5, respectively; the overall rating was 6.1.

HSBC diabetes survey, June 2007: Customer service of current pump manufacturer in 2007 YTD relative to 2006

Current pump manufacturer	Same	Better	Worse
All	78%	13%	9%
MiniMed/Medtronic	76%	13%	11%
Animas/JNJ	89%	7%	4%
Deltec/Smiths	69%	22%	8%
Disetronic/Roche	73%	7%	20%
Insulet	71%	29%	0%
Nipro	100%	0%	0%

Source: HSBC survey

HSBC diabetes survey, June 2007: Pumpers that would recommend their current pump to other users

Current pump manufacturer	N	Yes	Maybe	No
All	280	82%	12%	6%
MiniMed/Medtronic	147	84%	10%	5%
Animas/JNJ	63	82%	11%	6%
Deltec/Smiths	46	87%	13%	0%
Disetronic/Roche	18	44%	28%	28%
Insulet	7	100%	0%	0%
Nipro	1	100%	0%	0%

Source: HSBC survey

HSBC diabetes survey, June 2007: Pumpers that would consider switching to another pump manufacturer

Current pump manufacturer	N	Yes	Maybe	No
All	280	11%	22%	67%
MiniMed/Medtronic	146	8%	19%	73%
Animas/JNJ	63	17%	30%	52%
Deltec/Smiths	45	7%	24%	69%
Disetronic/Roche	18	39%	17%	44%
Insulet	7	0%	0%	100%
Nipro	1	0%	0%	100%

Source: HSBC survey

Insulin pump satisfaction

Overall, 82% of pumpers would recommend their current pump to other users (12% Maybe, 6% No). Broken down by manufacturer, 84% of MiniMed pumpers would recommend their current pump (10% Maybe, 5% No), 82% of Animas pumpers would recommend their current pump (11% Maybe, 6% No), 87% of Deltec pumpers would recommend their current pump (13% Maybe), 44% of Disetronic pumpers would recommend their current pump (28% Maybe, 28% No), 100% of Insulet pumpers would recommend their current pump, and the one Nipro pumper would recommend the pump.

We asked pumpers whether they considered switching to a pump made by a different manufacturer. Overall, pumpers preferred to stay with their current pump manufacturer: only 11% (n=32) said Yes (22% or 61 people said Maybe and 67% or 187 said No). Broken down by manufacturer, 8% of MiniMed pumpers (19% Maybe), 17% of Animas pumpers (30% Maybe), 7% of Deltec pumpers (24% Maybe), 39% of Disetronic pumpers (17% Maybe), and 0% of Insulet pumpers (0% Maybe) are considering

switching to a new pump manufacturer; the one Nipro pumper is not considering switching.

For those pump users considering switching to a different pump manufacturer (n=93), we asked to which manufacturer(s) and why would they switch. Interestingly, 25% were undecided, 11% did not mention any specific manufacturer but wanted to switch to a pump with continuous glucose monitoring integration, 19% said MiniMed, 18% said Insulet, 13% said Animas, 11% said Deltec and 2% said Dana or Disetronic or Nipro.

Key reasons listed for considering switching to MiniMed included: integration with CGM, features, size and weight, software, and synchronization with on-line web log.

Key reasons listed for considering switching to Insulet included: no tubing, can hide device, no worry about clipping it to something, wireless control device, and works with Freestyle meter.

Key reasons listed for considering switching to Animas included: size and weight, customer service, hardware, insurance covers it, waterproof, food database, more customizable, smaller

basal/bolus increment, screen, and advanced options.

Key reasons listed for considering switching to Deltec included: features, software, and customer service

OmniPod disposable pump

We asked pumpers whether they would consider switching from their current insulin pump to the disposable OmniPod pump: 13% answered Yes, 39% answered Maybe and 48% answered No.

Benefits from OmniPod

Those pumpers interested in wearing OmniPod listed the following reasons: no tubing (less risk of kinks/blockages/accidental dislodgement) and gives more freedom of movement; wireless; easier insertion of cannula; smaller and lighter; much more discreet; like the idea of integrated BG monitor; not having to handle the pump itself to program; more features; “because it is an all in one unit that would make it closer to being a nondiabetic”; don't have to be attached; and cheaper upfront cost.

Concerns about OmniPod

Those pumpers not interested in wearing OmniPod listed the following reasons: no reimbursement; no way to control the functions except through the remote control device; bulk of the pod; not until they have a CGMS system; too big to wear directly on the body; like having the freedom to remove pump for certain activities where it would get in the way or look odd; no control over system; don't know enough about it; concerned about wearing pod in water (shower/swimming); like to use whirlpool bath regularly and understand there are problems with having the pod in hot water for an extended period of time; lack of smaller 0.025 basal rate; no vibrate feature; you can't move it from place to place when you want to make it less visible unless you switch to a whole new pod; PDM is bigger

than my current pump; since use little insulin, would be wasting a lot of insulin; doesn't hold enough insulin; less environmentally sound than the other pumps; satisfaction with products and staff of current pump manufacturer; could lose the PDM; not always available to change set at a set time; can't address capabilities of the various pumps; due to line of work, concerned with it being pulled off; no sales rep in our area and they never reply to my emails; if the infusion site doesn't work the whole thing is a throwaway; some sets I leave in for up to four days, so having the pod automatically shut down in three is too limiting; think the pod looks like an egg stuck on someone's body; my endocrinologist does not support it; and needs to be thin enough to not be noticeable.

Current OmniPod users

For the seven people using OmniPod, overall customer satisfaction was high at 9.0. The key reasons the users like the system are: includes no tubes, freedom, convenience, automatic insertion, waterproof, bolus calculator, ease-of-use, and discreetness. Features that can be improved or changed include: continuous glucose monitoring integration, beeper to locate PDM, size of pod, reduce waste/reusable parts, ability to download meter data, more flexibility for settings alarms/reminders, vibration or silence feature on pod, longer than three days before changing, bigger reservoir, and a way to remove insulin if pod doesn't work.

Inhaled Insulin

Only 5% or 15 of the survey respondents would consider using inhaled insulin (79% or 223 said No, 15% or 43 said Maybe).

Frequency of monitoring

Pumpers in our survey tested their blood sugar levels from two to 13+ times daily. Overall, 96% tested their blood sugar levels four or more times

a day, 63% tested their blood sugar levels seven or more times a day, and 11% tested their blood sugar levels 11 or more times a day.

HSBC diabetes survey, June 2007: Frequency of daily blood glucose testing

	Number	Percentage
All	281	100%
3 or less	12	4%
4 to 6	93	33%
7 to 10	145	52%
11+	31	11%

Source: HSBC survey

DexCom has priced its 7-day STS CGM sensors at USD60 each; assuming the system is used on label for 7 days, this equates to USD8.6 a day.

For those testing 11 or more times a day (USD0.80 each test strip), the cost of CGM and fingerstick testing would be about equal.

Medtronic has priced its 3-day Guardian sensors at USD35 each; assuming the system is used on label for 3 days, this equates to USD11.7 a day.

For those testing 15 or more times a day (USD0.80 each test strip), the cost of CGM and fingerstick testing would be about equal.

Interest in CGM

We asked pumpers if they were interested in wearing continuous glucose monitors from J&J/Animas (GlucoWatch), DexCom (STS), Medtronic/MiniMed (Guardian RT/Real-Time) or Abbott (FreeStyle Navigator). Overall, 204 of the

281 responders (73%) answered Yes to at least one CGM device. This interest was independent of blood glucose monitoring frequency: 75% of pumpers testing blood glucose 3 or less times a day, 69% testing 4 to 6 times a day, 75% testing 7 to 10 times a day, and 71% testing 11+ times a day answered Yes.

HSBC diabetes survey, June 2007: Interest in CGM based on frequency of BG monitoring

Freq of daily BG monitoring	N	Interest in CGM	Pct interested
All	281	204	73%
3 or less	12	9	75%
4 to 6	93	64	69%
7 to 10	145	109	75%
11+	31	22	71%

Source: HSBC survey

Broken down by manufacturer, 46% said Yes to Medtronic's Guardian RT/Real-Time, 35% said Yes to Abbott's FreeStyle, 30% said Yes to DexCom's STS, and 9% said Yes to J&J's GlucoWatch.

If we look at only the current Medtronic insulin pump users (n=146), 66% said Yes to Medtronic's Guardian RT/Real-Time, 21% said Yes to Abbott's FreeStyle, 18% said Yes to DexCom's STS, and 11% said Yes to J&J's GlucoWatch.

If we look at non-Medtronic insulin pump users (n=135), 24% said Yes to Medtronic's Guardian RT/Real-Time, 50% said Yes to Abbott's FreeStyle, 42% said Yes to DexCom's STS, and

HSBC diabetes survey, June 2007: Interest in specific CGMs

Current pump manufacturer	N	Pct GlucoWatch/JNJ	Pct STS/DXCM	Pct Guardian/MDT	Pct Navigator/ABT
All	281	9%	30%	46%	35%
MDT pumpers	146	11%	18%	66%	21%
Non-MDT pumpers	135	6%	42%	24%	50%
Animas pumpers	63	6%	48%	33%	37%
Deltac pumpers	46	4%	43%	20%	74%
Disetronic pumpers	18	11%	28%	17%	39%
Insulet pumpers	7	0%	29%	0%	57%
Nipro pumpers	1	0%	0%	0%	0%

Source: HSBC survey

6% said Yes to J&J's GlucoWatch. Animas pumpers had a preference for DexCom's STS, and Deltec and Insulet pumpers had a preference for Abbott's Navigator, which makes sense given that both companies' insulin pumps are integrated with an Abbott Freestyle blood glucose meter.

We asked pumpers if they at any point tried using any of the continuous glucose monitors. Overall, 95 of the 281 responders (34%) answered Yes to at least one CGM device. Broken down by manufacturer, 19% said Yes to Medtronic's Guardian RT/Real-Time, 3% said Yes to Abbott's FreeStyle, 14% said Yes to DexCom's STS, and 7% said Yes to J&J's GlucoWatch.

We asked pumpers if they are currently using any of the continuous glucose monitors. Overall, 66 of the 281 responders (23%) answered Yes to at least one CGM device: 25 people using DexCom, 40 people using Medtronic, and one pumper using both DexCom and Medtronic. Broken down by manufacturer, 15% said Yes to Medtronic's Guardian RT/Real-Time, 0% said Yes to Abbott's FreeStyle, 9% said Yes to DexCom's STS, and 0% said Yes to J&J's GlucoWatch.

HSBC diabetes survey, June 2007: CGM interest and use summary

N = 281	Interest in wearing	Have tried wearing	Currently using
At least one CGM	73%	34%	23%
JNJ/Animas GlucoWatch	9%	7%	0%
DexCom STS	30%	14%	9%
Medtronic/MiniMed Guardian	46%	19%	15%
Abbott FreeStyle Navigator	35%	3%	0%

Source: HSBC survey

Benefits from CGM

Pumpers interested in CGM listed the following benefits: better management of diabetes, more data to base decisions about basal rates and corrective doses, tighter glucose control, know BG levels more often, trend data, make minor adjustments at any time, peace of mind, less

fingersticks, safety, improve results from pump therapy, avoid future complications as well as the immediate complication of severe hypoglycemia, alarm when blood glucose is low, less hypoglycemic episodes, lower A1c's, hypoglycemic unawareness, worry about hypos at night especially, not so many highs when playing sports, to be able to adjust basal rates and post meal blood glucose levels, and extreme reactions while sleeping (near death experiences and occur 8 to 12 times a year).

Concerns about CGM

Pumpers listed the following concerns about CGM: cost, no reimbursement, wait for the bugs to be ironed out and technical advances to be made, much more time and effort to use, aren't accurate enough, not cost effective, do not want to have to insert something else into the body, need approval without fingerstick confirmation, don't know enough about device to decide, not fashionable enough, don't want a device that has to be constantly monitored, don't trust the technology yet, too annoying, no need, poor accuracy, not waterproof, and another site that will add to the scar tissue from wearing the pump.

Comments on specific CGMs

Overall, people stated preferences for MDT's Guardian because of the integration with their insulin pump and not having to carry around extra equipment (monitor). Preferences for DXCM's STS were for its availability, accuracy, price, small sensor, and longer sensor life. Preferences for ABT's Navigator were for its superior accuracy, positive user feedback, already using FreeStyle meter, and waterproof. Preferences for GlucoWatch were for its convenience.

Specific responses are highlighted below:

- ▶ 'I would be most interested in the Medtronic device integrated with their insulin pump but my experience with their customer service has

approved for a longer wearing, waterproof sensor which looks extremely promising.'

- ▶ 'I'm waiting for Animas to come out with their CGMS solution; if it shows significant improvement over what's currently available, I'll see about getting one, depending if insurance coverage is available by then. I've also heard some encouraging comments about the Abbott Navigator system.'
- ▶ 'Since I use the Deltec Cozmo pump, I'm particularly interested in the Abbott Navigator; but the results from the DexCom and Medtronic devices are quite good.'
- ▶ 'I have read poor reviews of the GlucoWatch and would feel that I couldn't trust the results.'
- ▶ 'If I had to recommend a CGM I would recommend the MiniMed If they already own a MiniMed pump or the Navigator if they are on shots.'
- ▶ 'I am interested in the Freestyle Navigator because of the small sensor device that is attached to the skin.'
- ▶ 'Started with Dexcom originally. Very good customer service and was willing to prepare insurance claim for us which Medtronic would not and was terrible about even getting detailed invoice to use for claim. Switched from Dexcom to Medtronic MiniLink monitor when came out with smaller sensor because only need to carry one device for pump and monitor rather than two devices.'
- ▶ 'Have used in the past, currently not using because of a study I'm in. I miss it!!! Was satisfied with my previous use of DexCom, customer service was fantastic, however, not being waterproof was a major concern. Totally interested in trying the Navigator as it is waterproof and reputed accuracy is better

than anything else available. Am not interested in Medtronic system because of major dissatisfaction with their customer service when I used one of their pumps.'

- ▶ 'I am currently using the Medtronic Real-Time. I would consider using the Navigator If it ever makes it through the FDA. I wore the DexCom for a week trial period and went with Medtronic because I liked not having to carry another piece of equipment with me.'
- ▶ 'We currently use the Dexcom and have had very good results. We are interested in Medtronic because we like the idea of having the CGMS as part of the pump. We know people who have used the Navigator in clinical trials and have raved about it.'
- ▶ 'I'm most interested in the Navigator, because I'm very happy with the Freestyle Flash, and the Navigator itself sounds like it has good features. If the Navigator is still unavailable in 6 months, I'll decide between the other two - right now the Dexcom seems better.'
- ▶ 'I currently use the MiniMed Paradigm CGMS. I might have considered the Freestyle Navigator, as I do have a diabetic friend who tested it. However, the Navigator has not yet been approved and marketed for sale.'
- ▶ 'MiniMed nice to be integrated with your pump, one device to carry. I chose Dexcom because at the time MiniMed's sensor was too big of a thing to stick to you!'
- ▶ 'DexCom's superior accuracy and lower price than MiniMed. Abbott's superior accuracy to Dexcom (STS-3, for sure; 7-day version, maybe not).'
- ▶ 'GlucoWatch = burn; Medtronic = bad, poor customer service, expensive; DexCom = currently on!!; Navigator = one that I want!!'

- ▶ ‘The Abbott FreeStyle Navigator is reputed to be as accurate as a finger-prick tester. The DexCom STS is the most accurate currently available and is open system. I'm not interested in the Medtronic due to its high price. The GlucoWatch is worthless.’
- ▶ ‘Dexcom because I've done well with it in the past; Navigator because it has such frequent readings and because of its excellent reputation among those who are using them in studies; also because it is waterproof.’
- ▶ ‘[Medtronic]: Integral with insulin pump I have; didn't know there were others and the CGMS is what got me on the pump; works with the pump we currently have; I swear by everything MiniMed, excellent products, ahead of the competitors by miles, fabulous customer service.’
- ▶ ‘I only selected the Abbott. The GlucoWatch did not work. The Dexcom requires use of the One Touch BG monitor which requires a large amount of blood. I do not bleed easily, especially in winter, and gave that meter up for a Freestyle. The Medtronic is proprietary and I would have to use their pump which does not deliver basal in 3 minute increments. So I chose only Abbott. It uses the Freestyle strips which work for me. It will be integrated with my Cozmo pump. I am ready and waiting. Only problem is it does not get approved.’

CGM frequency of use

For those pumpers currently using a continuous glucose monitor (40 using Medtronic, 25 using DexCom, 1 using both), we asked how often and at what times they were using sensors. This was an open-ended question. For both systems, sensor use varied from occasionally to 24/7 and some people used sensors on-label, switching every 3

days, while others used sensors off-label for up to 2 or 3 weeks.

Responses from current Medtronic CGM users included (individual responses are separated by semicolons): 24/7; I check my glucose levels from my sensor readings at least once an hour; continuously, except for the few hour crossover between sensors; every day, for 6-7 days each; change sensors approximately every 5-6 days; change every 10-15 days as needed; sensors last 2-3 weeks; always hooked up for almost one year, I use sensors for 7 to 10 days on average, longest was 18 days; I wear the sensor 24 hours a day for at least 3 days at a time; I wear it all of the time, except when the tape bothers me, I then remove it for a few days; all the time, switch every three days; for at least 6 days at a time, sometimes 9 days, then I take a few days off of the sensor, and then go back on; one to two times a month for as long as it gives good readings, but not longer than 6 or 7 days; use 24/7, with a few days off a month, sensors last about 2 weeks; I use 365 days a year, so it means 122 sensor a year; I use sensors 9 days per sensor on average; one sensor every month, cost of sensor and no coverage from insurance prevents me to use it on a more frequent basis or all the time; when I am alone without someone for a couple of days or when my menstrual cycle is about to begin; right now continuous, whether this will continue depends on finances and how reliable they continue to be; during sporting tournaments, occasionally otherwise; throughout the day and especially at night, before driving, after meals, etc, it doesn't replace fingersticks but is accurate and there 24 hrs a day, go 7 days before switch sensor, too expensive for retired person to pay for without help, and CGM is wave of the future, just make it available for seniors who have to manage this disease.

Responses from current DexCom users included: we change the sensor when it no longer gives accurate readings or it falls off, usually about 7-9 days; 24/7, I get kind of nervous when I have 2 hours without sensor values after changing or re-starting; use the DexCom system approximately 15% of the time; I am using sensors consistently, it makes a tremendous difference in my diabetes management; I use it constantly even though I have to pay for it, I have used it since the first day I could get one in 2006, I plan to continue using them because it give me peace of mind; not often, too expensive and bulky; continuously; I swap the sensor after from nine days to fifteen days of use; 1-2 times a week; recently stopped wearing everyday, using approx 2-3 weeks to track changing BG patterns; travel, international and domestic (3-4 times every 12 weeks), and once a month.

CGM satisfaction

We asked pumpers to rate on a scale of 1-5 (5 being the best) the following characteristics for the applicable CGM devices they had experience with: Overall satisfaction, Accuracy/reliability, Ease of use, Size/comfort, and Customer support from manufacturer. Medtronic received the highest rating for overall satisfaction of 3.8 (n=56), followed by Abbott of 3.4 (n=5), DexCom of 3.2 (n=34), and GlucoWatch of 1.9 (n=17).

CGM reimbursement

About 82% of the pumpers currently using a continuous glucose monitor are paying out of pocket for continuous glucose monitoring sensors.

CGM market advances

We asked pumpers how important ten specific advances were in continuous glucose monitoring (CGM). The advances are listed below, ranked in the order based on percentage of pumpers that the advance was “very important”:

- ▶ Reimbursement for CGM devices/sensors: 86%
- ▶ More affordable CGM devices/sensors: 79%
- ▶ More integration of CGM with insulin pumps: 68%
- ▶ Non-invasive CGM devices: 55%
- ▶ Improvements in current FDA-approved CGM devices: 54%
- ▶ FDA approval for CGM as a stand-alone device (no confirmatory fingersticks): 52%
- ▶ New CGM manufacturers receiving FDA approval: 50%
- ▶ Additional clinical data with CGM: 35%
- ▶ More users to report their experiences with CGM: 27%
- ▶ My doctor/CDE to recommend CGM: 25%

HSBC diabetes survey, June 2007: CGM ratings (5 being the best)

	GlucoWatch	DexCom STS	Medtronic Guardian	Abbott Navigator
Number of responses	17	34	56	5
Overall satisfaction	1.9	3.2	3.8	3.4
Accuracy/reliability	2.1	3.2	3.4	3.4
Ease of use	2.1	3.6	3.8	3.8
Size/comfort	2.1	3.2	4.0	3.4
Customer support from manufacturer	2.6	4.0	3.9	3.5

Source: HSBC survey

HSBC diabetes survey, June 2007: Importance of specific advances in CGM

	Very important	Important or Very Important	Not important
Reimbursement for CGM devices/sensors	86%	99%	1%
More affordable CGM devices/sensors	79%	98%	2%
More integration of CGM with insulin pumps	68%	97%	3%
Non-invasive CGM devices	55%	88%	12%
Improvements in current FDA-approved CGM devices	54%	96%	4%
FDA approval for CGM as a stand-alone device (no confirmatory fingersticks)	52%	85%	15%
New CGM manufacturers receiving FDA approval	50%	90%	10%
Additional clinical data with CGM	35%	86%	14%
More users to report their experiences with CGM	27%	74%	26%
My doctor/CDE to recommend CGM	25%	70%	30%

Source: HSBC survey

Disclosure appendix

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