

# Diabetes

Proprietary survey on insulin pumps and continuous blood glucose monitoring

- ▶ **Over 300 insulin pump users responded to our insulin pump and continuous blood glucose monitoring survey in September and October 2005; this report summarizes our observations**
- ▶ **These results are positive for the growth of the overall USD900m insulin pump market; Medtronic (MiniMed) is the current market leader in insulin pumps, followed by Roche (Disetronic), Animas, and Smiths Group (Deltec)**
- ▶ **These results also confirm the large, unmet need for reliable, real-time continuous glucose monitors; Medtronic and Animas have continuous monitors on the market, while Abbott and Dexcom should introduce their continuous monitors in the US in 2006**

We estimate that the worldwide insulin pump and disposables market will increase from USD800m in 2004 to USD930m in 2005 and to USD1.6bn by 2009 (15% '04-'09 CAGR). Through 2009, we expect Animas, Deltec, and, to a lesser degree, Roche, to continue to make inroads into gaining incremental share of (1) pumps sold to people previously not on pump therapy, and (2) pumps sold to people replacing their current pumps upon warranty expiration.

In the scenario in which a continuous glucose monitor that delivers real-time blood glucose levels, reliable hypo/hyperglycemia alerts, and trending information is commercially available, 20,000 new users in the first full year could amount to up to USD20m in monitor revenue and up to USD50m in annual disposable sensor (which lasts up to three days) revenue. We prefer to understand the labeling for each product approved by the FDA, the pricing structure, the reimbursement environment, and how the real-world experiences with the current and next generation devices compare to the clinical trial data before assigning any significant revenue to any of these products.

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## **Disclosures & Disclaimer.**

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

# Diabetes

- ▶ Over 300 insulin pump users responded to our survey
- ▶ USD900m insulin pump market poised to grow 15% through 2009
- ▶ Large unmet need for continuous blood glucose monitors

## Summary

Medtronic's MiniMed diabetes division is the leader in the estimated USD900m external insulin pump and associated disposables market. Disetronic (Roche), Animas, and Deltec (Smiths Group, partnered with Abbott) round out the top four insulin pump manufacturers. Sooil and Nipro also manufacture insulin pumps. Insulet is the newest entrant into the diabetes pump market with its OmniPod disposable insulin pump.

About 300 insulin pump users responded to our insulin pump and continuous blood glucose monitoring survey in September and October 2005. This report summarizes our observations.

These results are positive for the growth of the overall insulin pump market as they confirm the benefits of pump therapy and the positive impact on quality of life, and support our forecasts for increasing adoption rates with Type 1 diabetics. In the US, we believe that pump adoption will increase from about 23% of the one million people with Type 1 diabetes in 2004 to about 38% in 2009.

In terms of market share through 2009, we expect Animas, Deltec, and, to a lesser degree, Roche, to continue to make inroads into gaining incremental share of (1) pumps sold to people previously not on pump therapy, and (2) pumps sold to people replacing their current pumps upon warranty expiration.

The survey results also confirm the large, unmet need for reliable, real-time continuous blood glucose (BG) monitors. The GlucoWatch G2 external continuous glucose monitor, acquired from Cygnus, is currently available from Animas. Medtronic's Guardian RT minimally invasive continuous glucose monitoring system is available in the US, Canada, and Europe in limited cities. (Medtronic's CGMS System Gold, currently available, is used by professionals and does not provide real-time BG values.)

Dexcom submitted a PMA application to the FDA for its minimally invasive STS continuous glucose monitoring system in March 2005 and the product is still currently under FDA review for an expected launch in 1H06. Abbott anticipates launching its minimally invasive FreeStyle Navigator continuous glucose monitoring system in the US in 1H06, following additional data being submitted to the FDA PMA application, originally submitted in December 2003.

The near-term product launch timelines from other potential short-term continuous glucose monitoring entrants like Roche have not been clearly outlined. Implantable/long-term continuous glucose monitors are also in development from companies like Medtronic, Dexcom, and Animas.

## Background: Insulin pumps and continuous meters

According to the International Diabetes Federation (IDF; [www.idf.org](http://www.idf.org)), there are currently over 194 million people worldwide with diabetes. The countries with the largest number of people with diabetes include India (35 million), China (24 million), the US (16 million), Russia (10 million), and Japan (7 million).

According to the American Diabetes Association (ADA; [www.diabetes.org](http://www.diabetes.org)), about 21 million people have diabetes in the US, of which an estimated 15 million people have been diagnosed with diabetes. Of the estimated 15 million people diagnosed with diabetes, about 5-10% have Type 1 insulin-dependent diabetes and require 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 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 patients measure their blood glucose levels four or more times a day using finger capillary blood glucose measurements (i.e. finger sticks). 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, tingling sensations around the mouth), others have hypoglycemia unawareness or no symptoms. It is estimated about 10-20% of Type 1 diabetics have hypoglycemia unawareness, and it has been reported in up to 50% of unselected patients with Type 1 diabetes.

Also, it is reported that Type 1 diabetics, on average, suffer 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 patients with frequent incidences of severe hypoglycemia or hypoglycemia unawareness.

## Insulin pumps

Insulin pumps provide an alternative to daily injections and provide some Type 1 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 is a thin, plastic tube through which insulin is delivered from the pump to the patient. 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 eight to 10 days (depending on cartridge size and daily insulin usage).

## Increasing competition

Medtronic's MiniMed division (acquired in August 2001) is the insulin pump market leader (Paradigm pump) 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. Animas began shipping its first generation R1000 insulin pump in July 2000, launched its second generation IR 1000 insulin pump in 2002, its third generation IR 1200 insulin pump in April 2004, and its latest generation IR 1250 in February 2005.

In the US, Animas markets its products through both a direct sales force of about 55 sales representatives (paired with about 75 clinical diabetes educators) and distributors. Animas has shipped more than 14,500 pumps worldwide as of March 2004, and does not currently break out unit sales.

In June 2003, Roche stopped shipping insulin pumps to the US as a result of regulatory issues with the FDA, but continued to support its current customer base in terms of customer support and shipping of disposables. Roche is expected to re-enter the US market with its Accu-Chek Spirit by the end of 2005.

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 (TheraSense) FreeStyle meter. Deltec has sold about 18,000 pumps as of July 2005, most of which were in the US.

Sooil (Dana Diabecare pump) and Nipro (Amigo pump) also manufacture insulin pumps. Insulet is the newest entrant into the diabetes pump market with its OmniPod disposable insulin pump. Animas plans on launching its next generation IR 1275 and IR 1500 pumps in 2006, and its disposable insulin pump in 2007.

## Insulin pump market

We believe the insulin pump market is poised to grow through 2009, as new people are diagnosed with diabetes and the adoption rate for pump therapy increases, given the benefits over injections. We estimate the worldwide insulin pump and disposables market at USD800m in 2004, of which USD560m, or 69% of revenues, were generated from the US. We estimate that the worldwide insulin pump and disposables market will grow to USD1.6bn by 2009 (15% '04-'09 CAGR). Worldwide, we estimate the following insulin pump and disposable market share in 2004: 60% Medtronic, 23% Roche, 8% Animas, 6% Deltec, and 2% other.

In 2004, we estimate 245,000 insulin pump users in the US, which represents 23% penetration of Type 1 diabetics and less than 1% penetration of insulin-treated, intensively managed Type 2 diabetics. We estimate the following market share of the 245,000 installed base: 77% Medtronic, 8% Roche, 9% Animas, 6% Deltec, and less than 1% other. About 51% of the US pump and disposables market was derived from pump unit sales (40,000 new and 27,000 replacement pumps, at an average ASP of USD4,200), while 49% was derived from pump disposables revenue (about USD1,200 annually per installed pump user).

We estimate that the US insulin pump and disposables market will grow from USD560m to USD860m in 2009 (9% '04-'09 CAGR). In 2009, we expect the revenue breakdown to be 42% pumps and 58% disposables. In the US, we expect the installed base to increase from 245,000 to 430,000 in 2009 (12% '04-'09 CAGR), representing 38% penetration of Type 1 diabetics and 6% penetration of insulin-treated, intensively managed Type 2 diabetics. We expect the following market share of the 430,000 installed base: 63% Medtronic, 9% Roche, 14% Animas, 12% Deltec, and 2% other.

## Insulin pumps

Medtronic (MiniMed) Paradigm



Source: Company reports

Roche (Disetronic) Accu-Chek Spirit



Source: Company reports

Animas IR 1250



Source: Company reports

Smiths Group (Deltec) Cozmo



Source: Company reports

Infusion set for traditional insulin pump



Source: Diabetesnet.com

Insulet OmniPod – disposable insulin pump



Source: Company reports

Worldwide insulin pump and disposables market, 2001-2009e (USDm)

	2002	2003	2004	2005e	2006e	2007e	2008e	2009e	'04-'09e CAGR
US - patients diagnosed with diabetes (m)	13.4	14.1	14.7	15.3	15.9	16.6	17.2	17.8	
Type 1 diabetics	1.05	1.08	1.11	1.14	1.17	1.20	1.23	1.26	
Type 2: Insulin-treated, intensively managed	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	
<b>US total pump sales - new users and replacements (000)</b>	<b>47.4</b>	<b>54.3</b>	<b>67.2</b>	<b>73.1</b>	<b>76.5</b>	<b>80.1</b>	<b>83.7</b>	<b>86.9</b>	<b>5</b>
To new pump users (type 1 and 2)	36.3	38.1	40.0	44.3	45.7	47.7	49.7	49.2	4
Total cumulative new US pump unit sales (000)	179.1	217.2	257.1	301.4	347.2	394.9	444.7	493.9	14
YoY growth, %	25	21	18	17	15	14	13	11	
Cumulative number of type 1 pump sales	178.5	216.0	255.3	296.4	339.3	384.0	430.5	476.3	
<b>Cumulative penetration of type 1 patients, %</b>	<b>17.0</b>	<b>20.0</b>	<b>23.0</b>	<b>26.0</b>	<b>29.0</b>	<b>32.0</b>	<b>35.0</b>	<b>37.8</b>	
Cumulative number of type 2 (intensively managed) pump sales	0.6	1.2	1.8	5.0	7.9	10.9	14.2	17.6	
<b>Cumulative penetration of type 2 (intensively managed) patients, %</b>	<b>0.3</b>	<b>0.5</b>	<b>0.8</b>	<b>2.0</b>	<b>3.0</b>	<b>4.0</b>	<b>5.0</b>	<b>6.0</b>	
As replacements pumps	11.1	16.2	27.3	28.8	30.8	32.4	34.0	37.7	7
Pct replacement of total pump sales, %	24	30	41	39	40	40	41	43	
US total pump units sold (new and replacement) - market share, %	100	100	100	100	100	100	100	100	
Medtronic MiniMed	77	76	73	71	63	58	54	51	
Disetronic/Roche	10	3	0	2	7	10	11	12	
Animas	8.6	10.7	14.0	14.6	15.5	16.5	17.5	18.5	
Deltec/Smiths Group	4	9	12	12	13	14	15	16	
Other	0	1	1	1	2	2	3	3	
US total pump units sold (000)	47.4	54.3	67.2	73.1	76.5	80.1	83.7	86.9	
MiniMed	36.7	41.5	49.1	51.7	48.2	46.1	45.2	43.9	
Disetronic	4.7	1.4	0.0	1.5	5.4	8.0	9.2	10.4	
Animas	4.1	5.8	9.4	10.7	11.9	13.2	14.6	16.1	
Deltec	1.9	5.1	8.1	8.6	10.0	11.2	12.6	13.9	
Other	0.0	0.5	0.7	0.7	1.1	1.6	2.1	2.6	
Percent of patients discontinuing insulin pump use, %	2	2	3	3	3	3	3	3	
<b>US cumulative pump users (000)</b>	<b>176.2</b>	<b>210.8</b>	<b>244.4</b>	<b>281.4</b>	<b>318.7</b>	<b>356.9</b>	<b>395.9</b>	<b>433.3</b>	<b>12</b>
MiniMed	148.0	171.1	188.1	208.2	226.5	242.8	259.0	272.1	
Disetronic	19.6	19.8	18.9	19.8	22.4	27.2	32.2	37.5	
Animas	6.7	12.4	21.4	29.4	37.3	45.2	53.4	61.8	
Deltec	1.9	7.0	14.8	22.1	29.5	37.3	45.0	53.0	
Other	0.0	0.5	1.2	1.9	3.0	4.5	6.5	8.9	
US cumulative pump users - market share, %									
MiniMed	84	81	77	74	71	68	65	63	
Disetronic	11	9	8	7	7	8	8	9	
Animas	4	6	9	10	12	13	13	14	
Deltec	1	3	6	8	9	10	11	12	
Other	0	0	0.5	1	1	1	2	2	
US pump ASP (USD000)	4.3	4.3	4.2	4.2	4.2	4.2	4.2	4.2	
US pump revenue	204	233	282	307	322	337	352	365	5
US disposable revenue per pump user (USD000)	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
US disposable revenue	191	232	273	315	360	405	452	498	13
<b>US insulin pump and disposables market</b>	<b>395</b>	<b>466</b>	<b>556</b>	<b>623</b>	<b>682</b>	<b>742</b>	<b>803</b>	<b>863</b>	<b>9</b>
Pct pump revenue, %	52	50	51	49	47	45	44	42	
Pct disposable revenue, %	48	50	49	51	53	55	56	58	
<b>OUS insulin pump and disposables market</b>	<b>166</b>	<b>203</b>	<b>248</b>	<b>310</b>	<b>387</b>	<b>484</b>	<b>605</b>	<b>756</b>	<b>25</b>
<b>Worldwide insulin pump and disposables market</b>	<b>562</b>	<b>669</b>	<b>803</b>	<b>932</b>	<b>1,069</b>	<b>1,226</b>	<b>1,408</b>	<b>1,618</b>	<b>15</b>
Pct US, %	70	70	69	67	64	61	57	53	
Pct OUS, %	30	30	31	33	36	39	43	47	
Growth rate, %:									
US insulin pump and disposables market	21	18	19	12	9	9	8	7	
OUS insulin pump and disposables market	22	22	22	25	25	25	25	25	
<b>Worldwide insulin pump and disposables market</b>	<b>21</b>	<b>19</b>	<b>20</b>	<b>16</b>	<b>15</b>	<b>15</b>	<b>15</b>	<b>15</b>	
Worldwide market share, %	100	100	100	100	100	100	100	100	
MiniMed	63	62	60	58	54	51	48	45	
Disetronic	29	26	23	23	25	26	27	27	
Animas	4	6	8	9	10	11	11	12	
Deltec	2	4	6	7	8	8	9	9	
Other	1	2	2	3	4	5	6	7	

Source: Company reports, HSBC

## Continuous glucose monitors

Two real-time continuous glucose monitors are currently approved by the FDA: (1) the GlucoWatch G2 external continuous glucose monitor, acquired from Cygnus, and currently available from Animas, and (2) Medtronic's Guardian RT minimally invasive continuous glucose monitoring system available in the US, Canada, and Europe in limited cities.

Two minimally invasive continuous glucose monitoring systems – the FreeStyle Navigator from Abbott and the STS from Dexcom and – are anticipated to receive FDA approval in 2006.

Animas is working toward introducing the next generation G3 in 2006, the next generation G4 (we anticipate by 2008), and a next generation GlucoWatch that incorporates its new, painless micro-needle technology for market introduction in 2008 (i.e. MicroWatch).

The near-term product launch timelines from other potential continuous glucose monitoring entrants have not been clearly outlined.

### Medtronic (MiniMed): Guardian RT

Medtronic received FDA approval for its Guardian RT continuous glucose monitor in July 2005 for patients over the age of 18 with Type 1 and 2 diabetes, and has initiated a controlled market release in the US, Canada, and Europe. The Guardian provides both real-time glucose values and hypoglycemia and hyperglycemia alerts. The three components include a sensor that is inserted just under the skin (which lasts up to three days), a pager-size monitor, and a transmitter that adheres to the skin that transfers the measurements from the sensor to the monitor.

After the patient receives an alert, the episode must be confirmed by a finger stick measurement before the patient takes any action (i.e. adjust insulin/medication and/or food intake). The

glucose sensor has a two-hour initialization period. According to the FDA-approved indications for use, the device is not used as a standalone device – “values are not intended to be used directly for making therapy adjustments, but rather to provide an indication of when a finger stick may be required. All therapy adjustments should be based on measurements obtained using a home glucose monitor and not on Guardian RT values.”



### Animas: GlucoWatch G2

The GlucoWatch G2 Biographer from Cygnus was approved by the FDA in March 2002 as an adjunctive device to finger stick measurements for use in adults (18 and older) and children/adolescents (aged 7 to 17) with diabetes, and launched in the US in September 2002. The device has two components: the AutoSensor, which collects glucose measurements and lasts up to 13 hours, and the monitor, which is worn like a wristwatch and displays the glucose measurements.

The device is non-invasive as an electric current is applied by the device to extract glucose from interstitial fluid. About 3,500 G2 devices were shipped to end users between September 2002 and July 2003. From July to December 2004, Cygnus had a special promotion in which patients, with a prescription, could purchase the G2 for USD300

or less (versus USD872) and each AutoSensor for USD4 or less (versus USD9).

We believe the main advantage of the G2 relative to the Guardian RT is that it displays trend info and provides alarms when the patient's glucose is likely to be low within the next 20 minutes, in addition to hypo/hyperglycemia alarms. The device is also convenient to wear, non-invasive (does not require the insertion of a sensor into the body), and displays real-time glucose values. Like the Guardian RT, GlucoWatch users must confirm any alerts with finger stick measurements. We feel the accuracy and reliability of the G2 needs to be improved before it is widely adopted; consumer feedback is mixed as it works well in some patients and not well in others, and this discrepancy is not completely clear.

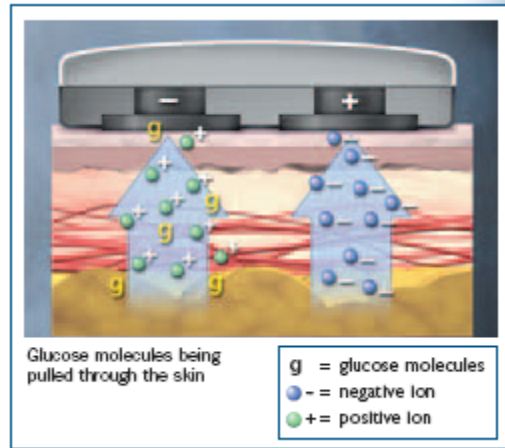
In March 2005, Animas acquired certain assets of Cygnus for USD10.6m, and plans on introducing the G3 following FDA approval in 2006; this generation should offer greater calibration success and fewer skipped readings. While early in development, Animas is working on incorporating micro-needle technology licensed from Debiotech into the GlucoWatch product that can potentially significantly improve efficacy and reliability and reduce irritation associated with the current version (MicroWatch).

Animas GlucoWatch G2 (acquired from Cygnus)



Source: Company reports

Animas GlucoWatch G2: non-invasive extraction



Source: Company reports

## Dexcom: STS

Dexcom's STS continuous glucose monitoring system is similar to Medtronic's Guardian RT device as it includes a sensor inserted just under the skin (using the STS applicator) and a handheld receiver. Like the GlucoWatch, the STS is intended to provide glucose trend data in addition to real-time values and hypo/hyperglycemia alerts. Dexcom submitted a PMA application to the FDA for its minimally invasive STS continuous glucose monitoring system in March 2005 and the product is still currently under FDA review for an expected launch in 1H06.

Dexcom STS



CAUTION - Investigational device.  
Limited by federal law to  
investigational use.  
Not available for sale.

Source: Company reports

## Abbott (TheraSense): FreeStyle Navigator

Abbott's FreeStyle Navigator is similar to Medtronic's Guardian RT device, as it consists of a sensor inserted just under the skin (which also lasts up to three days), a pager-size monitor, and a transmitter that is co-located with the sensor. Abbott anticipates launching its minimally invasive FreeStyle Navigator continuous glucose monitoring system in the US in 1H06. Like the GlucoWatch, the Navigator is intended to provide glucose trend data in addition to real-time values and hypo/hyperglycemia alerts.

Abbott submitted the PMA submission to the FDA in December 2003, but will supplement its PMA submission with additional data to support use of the Navigator as a standalone device (i.e. no confirmatory finger sticks). This would be a key advantage to the GlucoWatch G2 and Guardian RT from the payer's perspective, and we believe this should increase its chances of garnering third-party payer reimbursement. This would be a positive for those patients who are cost-sensitive or for which the need for confirmatory finger sticks is a barrier to adoption.

FDA may require that confirmatory finger sticks be used with the Navigator. The FDA's main concern would be that an erroneous reading prompts the patient to take the wrong action – i.e. if the patient was hypoglycemic, but the monitor signified that the patient was hyperglycemic, the patient would take action by taking insulin, which would further drive the patient into severe hypoglycemia.

Abbott (TheraSense) FreeStyle Navigator



Source: Company reports

Abbott FreeStyle Navigator sensor/transmitter



Source: Company reports

## Potential continuous glucose monitoring market

In the scenario in which a continuous glucose monitor that delivers real-time blood glucose levels, reliable hypo/hyperglycemia alerts, and trending information is commercially available, 20,000 new users in the first full year could amount up to USD20m in monitor revenue and up to USD50m in annual disposable sensor revenue. We believe the current version of the Animas GlucoWatch has limited market potential, given the poor reliability and skin irritation associated with the device.

We prefer to understand the labeling for each product approved by the FDA, the pricing structure, the reimbursement environment, and how the real-world experiences with Medtronic's Guardian RT, Dexcom's STS, Abbott's Navigator, and next generation GlucoWatch

devices compare to the clinical trial data before assigning any significant revenue to any of these products.

We anticipate the sensors for the STS, Guardian RT, and Navigator to be priced at a premium to the USD4 G2 AutoSensor due to the three-day versus 13-hour life, perhaps at around USD10-20 each. We may see pricing in the USD500-1000 range for the actual monitors. We believe the initial candidates for the continuous monitors may be the patients on insulin pump therapy with hypoglycemia unawareness who frequently test their blood sugar levels, or children with diabetes (on or off pump therapy) who suffer from night-time hypoglycemia (and whose parents currently check their glucose levels at night and want peace of mind).

Assuming about 20-40% continuous monitoring penetration of the 245,000 installed US insulin pump base (in 2004) would mean potentially 50,000-100,000 likely users of real-time continuous glucose monitoring. To reiterate, this is in the scenario in which the real-time continuous monitor delivers real-time values, reliable hypo/hyperglycemia alerts and trending info. If we assume 20,000 new users the first full year of sales, this would amount to USD10-20m in monitor revenue and about USD25-50m in annual disposable revenue (assuming about USD1,200-2,400 in disposable revenue per patient depending on the average selling price and frequency of use).

The GlucoWatch G2 Biographer from Cygnus was approved by the FDA in March 2002 and launched in the US in September 2002, and in its first nine months, about 3,500 G2 devices were shipped to end users between September 2002 and July 2003. During its FY2Q06 earnings call, Medtronic stated that it has sold over 100 Guardian RT units and continues to address

reimbursement with its ongoing STAR diabetes trial.

## Survey background

Insulin Pumpers (<http://www.insulin-pumpers.org>) provides support and information for people with diabetes. Over 300 of the approximately 5,000 insulin pump users worldwide in the Insulin Pumpers organization responded to our insulin pump survey in September and October 2005. This report summarizes our observations of the results.

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

<http://www.surveymonkey.com/Report.asp?U=131485650556>

## Survey questions

- 1 Age of insulin pump user
- 2 Type diabetes: I, II, Other
- 3 Which pump are you currently using (choose from list)
- 4 Is this your first pump
- 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 2005 to date, relative to 2004
- 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 Who was involved in the decision of which pump to use? Please check all that apply:

- You, Parent, Spouse, Other pump users,  
Friend, Doctor, Nurse/Diabetes Educator,  
Insurance/Health Plan, Other (please specify)
- 10 Which feature(s) do you like best about your current pump? Which feature(s) about your current pump do you wish could be improved?
  - 11 Would you recommend your current pump to others considering pump therapy
  - 12 Are you considering switching to a pump made by a different manufacturer
  - 13 If you answered Yes/Maybe to #12, which pump manufacturer(s) are you interested in switching to and why
  - 14 Insulet plans on launching its OmniPod disposable insulin pump in October ([www.myomnipod.com](http://www.myomnipod.com)). Would you consider switching from your current insulin pump to the OmniPod?
  - 15 Referring to the prior OmniPod question, why or why not
  - 16 What challenges do you think may be associated with wearing the OmniPod disposable pump daily
  - 17 Number of times on average you test your blood sugar level daily
  - 18 Are you interested in wearing a short-term/external continuous glucose monitor
  - 19 If yes, please explain why and describe in what situations a short-term/external continuous glucose monitor would be valuable to you or a family member
  - 20 Please list the features you require in a short-term/external continuous glucose monitor to be valuable to you or a family member
  - 21 Please rate the importance (5 being very important) of the following features of a short-term/external continuous glucose monitor: Hypoglycemic alert, Hyperglycemic alert, Real-time display of blood glucose level, Blood glucose level trend analysis, Device should be non-invasive, No need to confirm alerts with finger stick measurements, Low false alarm rate, Interacts with current insulin pump, Physically integrated with current insulin pump, Local remote telemetry that allows another person to hear the alerts/view the displays
  - 22 Please provide any additional comments regarding the importance of any of the above features in question #21 regarding continuous glucose monitors
  - 23 Medtronic MiniMed (<http://www.minimed.com/products/guardianrt/index.html>) plans to launch its GuardianRT continuous glucose monitor. Would you use the Guardian RT? Why or why not?
  - 24 Abbott/Therasense (<http://abbottdiabetescare.com/freestylenavigator/qa.aspx>) plans to launch its Navigator continuous glucose monitor. Would you use the Navigator? Why or why not?
  - 25 Dexcom (<http://www.dexcom.com/sts.php>) plans to launch its STS continuous glucose monitor. Would you use the STS? Why or why not?
  - 26 If you are considering using a short-term/external continuous glucose monitor, how often would you use it (check all that apply): 24 hours a day, Every day, Every night, Some days, Some nights, At least one 3-day period a week, At least one 3-day period a month, Other (please specify)

- 27 Have you tried the GlucoWatch continuous glucose monitor ([www.glucowatch.com](http://www.glucowatch.com))? Why or why not?
- 28 If you have tried the GlucoWatch, do you currently use it now? Why or why not? If so, how often do you use the GlucoWatch?
- 29 Animas plans on developing a next generation GlucoWatch that incorporates its new, painless micro-needle technology. This should reduce the irritation associated with the current version, and improve its efficacy and reliability. Would you consider using this product?
- 30 How important is health plan reimbursement for the following technologies, in order for you to consider using them: Medtronic MiniMed Guardian RT, Abbott/Therasense Navigator, Dexcom STS, GlucoWatch non-invasive continuous glucose monitor, OmniPod disposable insulin pump

## Respondent demographics

Most (46%) insulin pumpers (n=321) were between 41 and 60 years of age. About 12% were 18 and under, 29% between 19 and 40 years, and 13% were 61 and over. About 93% had Type 1 diabetes and 6% had Type 2 diabetes.

Age of respondents	
Category	Percentage (%)
6 and under	2
7-10	5
11-18	6
19-30	11
31-40	18
41-50	23
51-60	24
61 and over	13

Source: HSBC

## Insulin pump use

The breakdown of pump manufacturer (n=318) was as follows: 167 or 53% using MiniMed (Medtronic), 75 or 24% using Deltec (Smiths Group; pump-meter system developed with Abbott), 64 or 20% using Animas, and 12 or 4% using Disetronic (Roche).

When asked who was involved in the decision of which pump to use (more than one answer could be marked): 81% checked Self, 10.5% – Parent, 9% – Spouse, 15% – Other pump users, 5% – Friend, 35% – Doctor, 35.5% – Nurse/Diabetes Educator, 13% – Insurance/Health plan, and 3% – Other.

For about 41% of respondents, their current pump was their first pump. For the remaining 59%, we summarize the manufacturer of their most recent pump below (if given). For Animas pumpers on a prior pump, 29% were on an Animas pump, 2% were on a Deltec pump, 26% were on a Disetronic pump, and 43% were on a MiniMed pump. For Deltec pumpers on a prior pump, 10% were on an Animas pump, 24% were on a Disetronic pump, and 67% were on a MiniMed pump. For Disetronic pumpers on a prior pump, 83% were on a Disetronic pump and 17% were on a MiniMed pump. For MiniMed pumpers on a prior pump, 2% were on an Animas pump, 1% was on a Deltec pump, 4% were on a Disetronic pump, and 90% were on a MiniMed pump.

Current pump their first pump (%)		
	Yes	No
Animas	34	66
Deltec/Smiths	44	56
Disetronic/Roche	33	67
MiniMed	43	57
All	41	59

Source: HSBC

**If their current pump is not their first pump, the manufacturer of their most prior pump**

	Animas	Deltec/Smiths Group	Disetronic/Roche	Medtronic MiniMed	Sooil/Dana	Total
<b>Current manufacturer</b>						
Animas	12	1	11	18	0	42
Deltec/Smiths	4	0	10	28	0	42
Disetronic/Roche	0	0	5	1	0	6
Medtronic MiniMed	2	1	4	84	2	93
All	18	2	30	131	2	183
<b>Percentage (%)</b>						
Animas	29	2	26	43	0	100
Deltec/Smiths	10	0	24	67	0	100
Disetronic/Roche	0	0	83	17	0	100
Medtronic MiniMed	2	1	4	90	2	100

Source: HSBC

## Customer service

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, at an average of rating of 8.4. By manufacturer, the results looked consistent (keeping in mind the Disetronic subset is small), with Disetronic and Animas scoring the highest.

**Rating of customer service of current pump manufacturer**

Manufacturer	No. of responses	Service rating
Animas	64	8.8
Deltec/Smiths	75	8.5
Disetronic/Roche	12	9.2
Medtronic MiniMed	167	8.2
All	318	8.4

Source: HSBC

We also asked pumpers to rate the customer service of their most prior pump manufacturer. Pumpers previously on Animas, Disetronic, and MiniMed pumps rated the customer service on average at 8.5, 7.1, and 5.5, respectively. There were only two data points for Deltec and Dana.

**Rating of customer service of prior pump manufacturer**

Manufacturer	No. of responses	Service rating
Animas	18	8.5
Deltec/Smiths	2	7.0
Disetronic/Roche	30	7.1
Medtronic MiniMed	131	5.5
Dana	2	3.0
All	183	6.1

Source: HSBC

Third, we asked pumpers to rate the customer service of their current pump manufacturer in 2005 to date, relative to 2004. Overall, 78% of pumpers rated service as same, while 18% rated service as better and 4% rated service as worse. For Animas, 88% rated service as same, 7% rated service as better, and 5% rated service as worse. For Deltec, 73% rated service as same, 25% rated service as better, and 2% rated service as worse. For Disetronic, 83% rated service as same, 17% rated service as better, and 0% rated service as worse. For MiniMed, 76% rated service as same, 19% rated service as better, and 5% rated service as worse.

**Customer service YTD in 2005 relative to 2004**

Manufacturer	Number	Better (%)	Same (%)	Worse (%)
Animas	43	7	88	5
Deltec/Smiths	51	25	73	2
Disetronic/Roche	12	17	83	0
Medtronic MiniMed	140	19	76	5
All	246	18	78	4

Source: HSBC

## Pump satisfaction

Overall, 86% of pumpers would recommend their current pump to other users. Broken down by manufacturer, a higher percentage of Deltec and Animas users said Yes (95% and 89%) as compared to MiniMed and Disetronic (83% and 67%).

**Would recommend current pump**

	Number	Yes (%)	No (%)	Maybe (%)
Animas	63	89	5	6
Deltec/Smiths	75	95	3	3
Disetronic/Roche	12	67	25	8
MiniMed	166	83	7	10
All	316	86	6	7

Source: HSBC

We asked pumpers whether they considered switching to a pump made by a different pump manufacturer: 11% said Yes, 67% said No, and 21% said Maybe. Broken down by manufacturer, a smaller percentage of Animas and Deltec pumpers answered Yes (5% and 7%, respectively) or Maybe (20% and 17%, respectively) as compared to Disetronic and MiniMed (Yes, 25% and 15%, respectively; Maybe, 42% and 22%, respectively).

**Considering switching to different pump manufacturer**

	Number	Yes (%)	No (%)	Maybe (%)
Animas	64	5	75	20
Deltec/Smiths	75	7	76	17
Disetronic/Roche	12	25	33	42
MiniMed	167	15	63	22
All	318	11	67	21

Source: HSBC

For those pump users considering switching to a different pump manufacturer, we asked to which manufacturer would they switch.

Below is a summary responses, broken down by specific manufacturer (if a manufacturer was not mentioned, the response was listed in the “n/a” category). The numbers overall were small. For current Animas pumpers, the majority considered switching to Deltec or Roche. For current Deltec pumpers, the majority considered switching to Animas. For current Disetronic pumpers, the

majority considered switching to Animas. For current MiniMed pumpers, the majority considered switching to Animas or Deltec.

**Switching to Animas**

We highlight reasons listed for switching to an Animas pump: “the future technology of the micropump; if they come out with pump that holds 300 unit of insulin; food diary in their 1250 pump; satisfaction of pump users; superb customer support; like the 0.025 increment (but not the time preset); seems more friendly according to insulin-pumpers newsgroups; never had a water resistance issue; waterproof; temporary basal rates can be set as percentage of normal basal, calculates insulin still working in body; larger screen and user interface for the food database and for the non-proprietary reservoir and infusion set; pump is smaller, goes into water and you can set the duration of insulin according to your metabolism; the support staff are all professionals and they have improved greatly since we started; because it has built in carb values; smallest basal increments available currently; most of my doctor’s patients are on Animas pumps.”

**Switching to Deltec**

We highlight reasons listed for switching to a Deltec pump: “satisfaction of pump users; attached glucose meter; program specific foods; has more features relating to basal and bolus rates; bolus wizard; waterproof; easier to program; software upgradable; missed meal bolus alerts and the site change reminders; can customize the pump display.”

**If considering switching pump manufacturers, would switch to the following manufacturers (number)**

Current manufacturer	Animas	Deltec	Disetronic Roche	MiniMed	OmniPod	Other	N/A
Animas	0	4	4	2	2	1	5
Deltec	6	0	0	1	2	0	10
Disetronic/Roche	2	1	0	1	0	0	3
Medtronic/MiniMed	20	15	3	0	6	1	16
All	28	20	7	3	10	2	34

Source: HSBC

## Switching to Disetronic

We highlight reasons listed for switching to a Disetronic pump: “I really liked my HTron and having a back up pump; need more units basically; I was always satisfied with their products before I was forced to switch; it comes with a palm pilot.”

## Switching to MiniMed

We highlight reasons listed for switching to a MiniMed pump: “remote control option that allows you to manipulate bolus and basals without having to dig out your pump; was happy with my other pumps (I switched because my 511 suddenly became unwatertight); if they come out with pump that can use any infusion set.”

## Switching to OmniPod

We highlight reasons listed for switching to an OmniPod pump: “uses the same brand of test strips (Freestyle) as Deltec; tubeless and wireless; smaller, more concealable; new and different and I like the idea of the pump and needle being on the same part.”

## OmniPod disposable pump

We asked pumpers whether they would consider switching from their current insulin pump to the disposable OmniPod pump on a permanent or part-time basis. On a permanent basis, 8% answered Yes, 42% answered No, and 50% answered Maybe. On a part-time basis, 8% answered Yes, 36% answered No, and 56% answered Maybe. Broken down by manufacturer, a lower percentage of Animas and Deltec pumpers answer Yes or Maybe on a permanent basis (this gap was more narrow relative to part-time use).

### Considering switching to OmniPod on a permanent basis

	Number	Yes (%)	No (%)	Maybe (%)	Y/M (%)
Animas	60	7	47	47	53
Deltec/Smiths	69	17	46	36	54
Disetronic/Roche	12	17	33	50	67
MiniMed	157	4	38	57	62
All	298	8	42	50	58

Source: HSBC

### Considering switching to OmniPod on a part-time basis

	Number	Yes (%)	No (%)	Maybe (%)	Y/M (%)
Animas	46	7	39	54	61
Deltec/Smiths	57	9	40	51	60
Disetronic/Roche	11	9	36	55	64
MiniMed	136	7	33	60	67
All	250	8	36	56	64

Source: HSBC

Below are specific reasons why pumpers answered Yes or No to considering the OmniPod.

### Yes to OmniPod

- ▶ While the fill volume is a bit small for my needs, I like the no-strings concept and the wet-ability of the unit (ie showering with it).
- ▶ I don't have a pump. Any pump less than USD2500 would have my purchase since my insurance caps DME at USD2500 annually.
- ▶ Never heard about OmniPod until this very second. It looks very cool, but I haven't seen enough to know whether the lack of tubing beats the ability to move the pump anywhere.
- ▶ No insulin cartridge filling. Ease of use with the remote palm unit. No tubing to get caught on stuff, or to run through clothes. The one thing that stops me is the worry of hitting a bad site when I insert it.
- ▶ I never heard about it until now, and it looks really cool. I love the idea of no tubing that gets in the way of my clothes and no bulky pump clipped on my belt, but rather that I could put the 'PDM' in my purse! Awesome!! Plus it's a glucose meter.

- ▶ I love the idea of a disposable pump. Then I wouldn't have to worry so much about the one I have being broken/malfunctioning and having to figure out how to go back to shots. Also, I think it would be smaller/more discreet.
- ▶ Because I met someone this weekend who does diabetic education and she started talking about it. It sounds fantastic, as long as the price is reasonable.
- ▶ I am at present using MDI to control my diabetes which is working out quite well. However, I would love to be able to stop injecting myself so many times and if using a pump will enable this, then I would love to use an OmniPod pump.
- ▶ No wiring, I can control everything from a remote.
- ▶ If the portability makes usage easier than traditional pumps, I would seriously consider.
- ▶ no thicker than my current Quickset infusion set.
- ▶ I like a very low profile infusion set. Too much wasted if the insertion has a problem. Must carry another device in order to bolus or change anything.
- ▶ Waste if for a pool or hot tub or warm bath use.
- ▶ Way too many adhesive issues.
- ▶ Probably expensive.
- ▶ Does not provide a closed loop insulin delivery system.
- ▶ I think the pod will make it hard for me to wear a seat belt in my auto.
- ▶ Concerned about reliability of each pod.
- ▶ Not water resistant so it cannot be used in the shower or when swimming.
- ▶ Does not have integrated BG monitoring in real time.

### No to OmniPod

- ▶ Too much waste in throwaways; not a fan of disposable pump.
- ▶ I do not want a pump that communicates using RF.
- ▶ Do not like the idea of having a lump attached to me.
- ▶ Just started as a pumper in December; insurance would not approve a change even if we wanted to make one.
- ▶ The unit that talks to the pump is not connected to the person.
- ▶ Too thick and bulky to wear under tight clothing. I wear most infusion sites on my legs or hips and the current infusion sets stick up enough. The OmniPod would have to be
- ▶ Completely happy with my current pump and the patient support that I receive.
- ▶ I feel that the upkeep of this type pump would be too much.
- ▶ Not sure my insurance would pay for two insulin infusions systems, so I'm sure that part-time would be out of the question.
- ▶ I do not believe it would be better for me.
- ▶ Want to wait until kinks are worked out until I consider.
- ▶ If a bad site occurs, all the insulin is wasted because of total integration of site unit and insulin storage.
- ▶ I have no idea who OmniPod is.

- ▶ I've also heard about some 'kinks' I'd like to see worked out.
- ▶ Had questions that they did not answer, and seems like it will be a waste of supplies and insulin when used and needs replacing when swimming or falling off.
- ▶ It will not be covered by my insurance.
- ▶ No history.
- ▶ It doesn't sound convenient to me either set wise (I need angled sets) or waterproof wise.
- ▶ My pump is very robust and has never broken in four years. I am concerned about the quality of a throwaway pump.
- ▶ Sounds like too large of an item to be stuck to me 24/7. Also, the biggest issue I'd have is that it's not able to be disconnected, and once you do disconnect, it must be thrown away. Often times, a site can be too sore to use, or go bad after a day.
- ▶ I would not switch to a new product that is dependent on computer technology until it has been widely used for at least 1-2 years and the 'bugs' are fixed.
- ▶ As a Type 2, I need a larger reservoir. Also, it doesn't appear to be capable of fine-tuning as well as a conventional pump.
- ▶ I don't think it sounds too comfortable and I would have to change it more often.
- ▶ I would only use OmniPod as a back-up if the insurance company would cover it 100%.
- ▶ It looks like it will waste a lot more insulin than current pumps (since the reservoir is part of the infusion set). It appears that it will be much more likely to catch on clothing and be more restrictive in infusion site choices.
- ▶ Want small-slim pump that can be easily disconnected.
- ▶ Doesn't offer any advantage to me.
- ▶ I will wait until I hear other people's experiences first.
- ▶ I am switching my infusion sets every two days, so I would consider it as waste to switch the pod every two days.
- ▶ I don't like that fact that if something goes wrong with the site on my body, I have to throw the whole thing away. I lose all the insulin and the unit.
- ▶ A small company that can only survive by being bought out scares me. They do not have a family of products, just the one coming out and that can be problematic.

## Overall pump therapy

We had also conducted a similar survey in October 2004 on just insulin pump therapy with over 600 insulin pumpers. For further details, individual responses can be viewed at:  
<http://www.surveymonkey.com/Report.asp?U=67079055044>

We asked pumpers what were the biggest reason(s) for getting on the pump and for possibly not getting on the pump. The most frequent reasons for getting on pump therapy included better control (less high/lows, better HbA1c control), freedom and flexibility in lifestyle, fewer shots, and a desire for a longer and healthier life.

Key reasons for not possibly getting on the pump included being attached to the device 24/7, cost of the pump and supplies, fear of adverse outcomes if the pump failed or insulin was not being delivered correctly, lack of insurance coverage or dealing with insurance, outward visible signs of having diabetes, the learning curve, difficulty in finding a physician to put a child on an insulin

pump, not understanding it or knowing anything about pumps, fear of not being able to operate the pump correctly, fear of losing insurance coverage for pump supplies, possibility of weight gain, still having to use needles (infusion sets) every 2-4 days, horror stories of malfunctioning pumps, “psychological, as it’s a new and different way of taking insulin with its own set of challenges,” was doing great without it, little support from doctor, fear of change, finding a doctor to prescribe it, “idiots in insurance companies,” greater possibility of infections and ketoacidosis (DKA), and “didn’t understand the pump; my original doctor didn’t either.”

We asked users to rate their quality of life (10 being the best) before and after the pump. Overall, quality of life improved 3 points, from an average of 5.8 before the pump to 8.8 after the pump. For the most part, the results broken down by manufacturer were consistent.

When asked if they would recommend pumps to others considering pump therapy, 96.5% answered Yes, 0.2% answered No, and 3.3% answered Maybe.

When asked if users were planning to stay on pump therapy, 97.4% answered Yes, 0.5% answered No, and 2.1% answered Maybe.

Reasons for not staying on pump therapy included: “not the best solution for a brittle diabetic with low body fat, skin irritation, having to test blood glucose all the time, bad customer service, medical supplies are a hassle and facing burn out right now, pump therapy does nothing that injections didn’t, insurance, cost, its very uncomfortable, had DKA twice (due to problems with infusion sets) and have been hospitalized for this since I began pump therapy (never was hospitalized for DKA in previous 13 years of having Type 1 diabetes), depending on it 24/7, control lately is not so good, inconvenient to carry

around, has not fundamentally provided more stable blood glucose levels than multiple daily injections, and is not as discrete or comfortable as it should be.”

## Frequency of monitoring

Pumpers in our survey tested their blood sugar levels from one to 13+ times. Overall, 98% tested their blood sugar levels four or more times a day, 63% tested their blood sugar levels seven or more times a day, and 7% tested their blood sugar levels 11 or more times a day.

### Frequency of daily blood glucose monitoring

No. of times a day	No. of pumpers	Pct of pumpers (%)
3 or less	7	2
4 to 6	109	34
7 to 10	177	56
11+	23	7
All	316	100

Source: HSBC

## Interest in continuous glucose monitors

An overwhelming 94% percent of pumpers are interested in wearing a continuous glucose monitor (59% Yes and 35% Maybe). These results were independent of pump manufacturer.

### Interest in continuous monitors, by pump manufacturer

	Number	Yes (%)	No (%)	Maybe (%)	Y/M (%)
Animas	64	63	6	31	94
Deltec/Smiths	75	61	5	33	95
Disetronic/Roche	12	83	0	17	100
MiniMed	167	55	7	38	93
All	318	59	6	35	94

Source: HSBC

Broken down by frequency of blood glucose testing, 71% (14% Yes, 57% Maybe) of pumpers testing three or less times a day, 94% (59% Yes, 34% Maybe) of pumpers testing four to 10 times a day, and 100% (70% Yes, 30% Maybe) of pumpers testing 11+ times a day are interested in wearing a continuous glucose monitor.

This implies a very lucrative potential continuous glucose monitoring market, as 98% of pumpers test their blood glucose levels four or more times a day. We find it interesting that even those testing three times or less are interested in wearing a continuous glucose monitor (albeit the small sample size). This bodes well for penetrating Type 2s and Type 1s that test less frequently or are not on insulin pumps.

Interest in continuous monitors, by testing frequency					
Frequency	Number	Yes (%)	No (%)	Maybe (%)	Y/M (%)
3 or less	7	14	29	57	71
4 to 6	109	61	6	33	94
7 to 10	177	58	6	36	94
11+	23	70	0	30	100
All	316	59	6	35	94

Source: HSBC

## Why continuous monitoring

Pumpers were interested in wearing a continuous glucose monitor for numerous reasons, including:

- ▶ It would provide so much more info than finger prick tests
- ▶ To know what my sugars are all the time
- ▶ Alert to highs and lows
- ▶ Have frequent, no-symptom lows
- ▶ Better control if I can constantly see blood glucose and adjust
- ▶ Wouldn't have to constantly prick my fingers
- ▶ To test basal rates and follow blood sugar trends while exercising
- ▶ To help fine-tune management of blood glucose
- ▶ It's annoying to carry around my testing supplies everywhere; I'd rather have a device that is connected to me, as long as it's small and discreet
- ▶ To have a way to test overnight without having to wake up to test all night

## Features of continuous monitoring

Pumpers interested in wearing a continuous glucose monitor listed the following features as valuable: small size, real-time readings, accurate readings, alarm for low or high blood glucose levels, ease of use, not too painful, durability, must be able to save data to evaluate it for trends or problem areas, must be accurate enough to use information to dose insulin, disconnect for showering/swimming or waterproof, affordable price, no skin burns, not a huge number of blood tests to calibrate the unit, ease of insertion/injection, no long calibration period, not too many alarms that go off all the time or can't be customized, comfort, sends data to a pump, covered by insurance, not too many negative side effects, thin profile (much more important than overall size, so it doesn't cause a large bulge), reputation, if worn on the wrist like a watch the watch itself would be as small as an actual watch, small insertion piece, viewable display, good remote unit with an alarm that sounds when levels are out of range, must have the vibration choice, at least last for three days similar to the pump, unaffected by sweat, I do not want a large device stuck to the side of my arm for all to see.

We asked pumpers to rate the following 10 key features for a short-term (versus implantable) external continuous glucose monitor (5 being very important): hypoglycemic alert, hyperglycemic alert, real-time display of blood glucose level, blood glucose level trend analysis, device should be non-invasive, no need to confirm alerts with finger stick measurements, low false alarm rate, interacts with current insulin pump, physically integrated with current insulin pump, local remote telemetry that allows another person to hear the alerts/view the displays.

With 320 total respondents: real-time display, hypoglycemic alert, low false alarm rate (i.e. accurate) and hyperglycemic alert were the most important features, with each scoring an average of over 4 points. Tallying the percentage of pumpers who ranked the remaining six features a 4 or 5: 67% for trend analysis, 64% for interacts with current pump, 63% for no need to confirm with finger sticks, 52% for physically integrated with current insulin pump, 50% for device should be non-invasive, and 30% for local remote telemetry capability. From additional comments regarding features, it was clear that “accuracy is paramount.”

Also, relative to the need for remote telemetry capability, below are additional comments:

- ▶ The last question is totally irrelevant to me but I can see it would be important for the parents of a child
- ▶ Live alone; would benefit from having an alarm notify someone else when lows are happening
- ▶ It would be nice if I could be alerted to what is happening with his BG while he was at school on my cell phone
- ▶ I can see where the last option about local remote telemetry would be highly beneficial for the elderly or handicapped

## Frequency of use of continuous monitoring

We asked pumpers how often they were considering using a continuous glucose monitor (multiple answers were allowed). Overall, 47% answered 24 hours a day, 19% every day, 16% every night, 19% some days, 17% some nights, 18% at least one three-day period a week, and 20% at least one three-day period a month. The 15% other responses included:

- ▶ When changing insulin doses or if feeling ill
- ▶ Stress or travel times
- ▶ One three-day period each quarter; one 24-hour period/month
- ▶ Probably continuously for a couple of months, and then dropping to a three-day period every week or two
- ▶ If it eliminated finger sticks, I would wear it all the time
- ▶ Ideally 24/7 but would depend on cost
- ▶ If I were checking overnight basals, I'd use it three or four nights in a row; if I were checking how exercise affects my blood sugar, I'd wear it three or four times a week
- ▶ During pregnancy as insulin needs change
- ▶ During periods of exercise or when flying

Rank of key 10 features (5 being very important) for continuous glucose monitors, %

Rank:	1	2	3	4	5	Avg (#)	4 or 5	3,4,5
Real-time display of blood glucose level	3	2	9	14	72	4.5	86	95
Hypoglycemic alert	6	2	8	13	72	4.4	85	93
Low false alarm rate	3	6	18	25	48	4.1	73	91
Hyperglycemic alert	7	5	13	24	51	4.1	75	88
Blood glucose level trend analysis	3	10	21	32	35	3.9	67	88
No need to confirm alerts with finger stick measurements	5	11	22	22	41	3.8	63	85
Interacts with current insulin pump	8	8	20	23	41	3.8	64	84
Device should be non-invasive	10	12	27	17	33	3.5	50	77
Physically integrated with current insulin pump	10	12	26	23	29	3.5	52	78
Local remote telemetry that allows another person to hear the alerts/view the displays	28	20	23	15	15	2.7	30	53

Source: HSBC

Frequency of use of continuous monitoring

	Percent (%)	Total
24 hours a day	47	141
Every day	19	58
Every night	16	48
Some days	19	56
Some nights	17	50
At least one 3-day period a week	18	53
At least one 3-day period a month	20	60
Other	15	44
Total respondents		310

Source: HSBC

Broken down by the number of blood glucose tests a day, it was interesting that over 40% of each test frequency group, including pumpers testing three or less times, would consider using a continuous glucose monitor 24 hours a day – 42-45% of those testing 10 times and under, and 52% of those testing 11+ times a day.

### Specific monitoring systems

We asked if pumpers were considering the use of specific short-term, continuous glucose meters – Medtronic MiniMed’s Guardian RT, Abbott’s Navigator, and Dexcom’s STS. Most of the Yes or No replies echoed the feedback regarding general reasons for use and the features required to consider using the device (which we have already discussed). It was interesting to note the differences among the perception of the three manufactures. We believe some pumpers’ distrust for MiniMed and/or Abbott and many pumpers’ unfamiliarity with Dexcom may be a barrier to adoption for their respective devices. We highlight a couple of the responses below.

### Respondent 1

- ▶ Medtronic: I’d try it since I’m a MiniMed customer. Depending on the features and accuracy, then I might use it permanently.
- ▶ Abbott: Probably not since I don’t use Freestyle products.
- ▶ Dexcom: Don’t know because I’ve never heard of this company.

### Respondent 2

- ▶ Medtronic: I have several pumper friends who have had problems; quality control is a problem.
- ▶ Abbott: Absolutely! Small blood requirement, very few problem readings (failed to read messages). Am very happy with Therasense and would look at anything they offered.
- ▶ Dexcom: I have no idea who Dexcom is. They have no visibility within the pumper community, and the company name and reputation means a lot when it’s something you’re going to wear 24/7/365.

### Next generation GlucoWatch

Out of 308 pumpers, only 25 (8%) pumpers stated that have tried the GlucoWatch. Of the 25, only two still use it. The first person uses it “maybe once every six months just to see what’s going on,” and the second person uses it “when I need to check on basal rates.” The key reasons for not using it anymore included associated burns, bulky, unreliable, failed to meet expectations,

Frequency of use of continuous monitoring, by testing frequency

Frequency	Number	24 hours	Every day	Every night	Some days	Some nights	At least one 3-day period a week	At least one 3-day period a month	Pct (%) 24 hours
3 or less	7	3	2	1	2	2	1	1	43
4 to 6	109	46	16	12	23	18	15	19	42
7 to 10	177	79	31	31	28	27	31	33	45
11+	23	12	6	2	2	2	5	6	52
All	316	140	55	46	55	49	52	59	44

Source: HSBC

failed to recognize trends, too much work, and costs/no reimbursement.

The key reasons for not trying GlucoWatch include negative user reviews regarding skin irritation, pain, poor accuracy, discomfort, long calibration period, size/bulkiness, cost, no docs recommending, having to still do finger sticks, not easy to use, no reimbursement. This underscores the importance of positive, early, real-world (versus clinical trial setting) experiences to work out kinks and before initiating a full market launch of any of the next generation monitoring devices.

Given limited adoption of the GlucoWatch, we asked whether pumpers would be interested in wearing a new design being currently developed by Animas that incorporates painless micro-needle technology that can potentially improve its accuracy. An overwhelming 90% of pumpers answered Yes (33%) or Maybe (58%). We also note that 55% of Animas pumpers marked Yes and 42% Maybe to considering this next generation MicroWatch.

**Interest in wearing the new GlucoWatch with micro-needles**

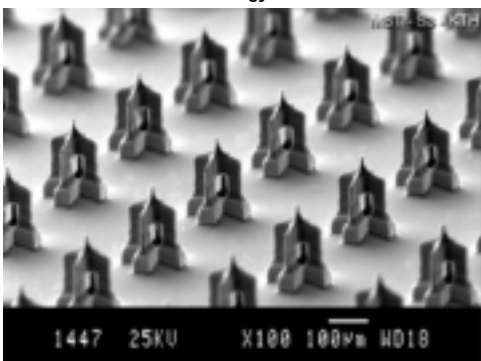
	Number	Yes (%)	No (%)	Maybe (%)	Y/M (%)
Animas	64	55	3	42	97
Dellec/Smiths	75	27	11	63	89
Disetronic/Roche	10	30	0	70	100
MiniMed	164	27	12	61	88
All	313	33	10	58	90

Source: HSBC

**Reimbursement key to adoption of new technologies**

Widespread adoption of any of the current and pending continuous glucose monitors and the OmniPod disposable insulin pump is clearly dependent on the manufacturers working with third-party payers to secure reimbursement. Between 63-71% of pumpers felt that reimbursement was very important to consider using these technologies (between 96-98% of pumpers believe reimbursement was very important or important).

Animas: Micro-needle technology licensed from Debiotech



Source: Company reports

Importance of reimbursement for adoption

	Not important	Important	Very important	Not considering using	Total
<b>Percent (%)</b>					
Medtronic MiniMed Guardian RT	2	13	70	15	100
Abbott/Therasense Navigator	2	15	71	11	100
Dexcom STS	4	15	63	18	100
GlucoWatch non-invasive continuous glucose monitor	2	15	67	16	100
OmniPod disposable insulin pump	2	11	70	18	100
<b>No. of responses</b>					
Medtronic MiniMed Guardian RT	7	40	221	47	315
Abbott/Therasense Navigator	7	47	220	35	309
Dexcom STS	11	45	191	56	303
GlucoWatch non-invasive continuous glucose monitor	7	45	208	50	310
OmniPod disposable insulin pump	5	34	220	56	315
Total respondents					321

Source: HSBC

# Disclosure appendix

## Stock ratings and basis for financial analysis

HSBC believes that institutional investors utilise various disciplines and investment horizons when making investment decisions, which depend largely on individual circumstances such as the investor's existing holdings, risk tolerance and other considerations. Given these differences, HSBC has two principal aims in its equity research: 1) to identify long-term investment opportunities based on particular themes or ideas that may affect the future earnings or cash flows of companies on a 2-year time horizon; and 2) from time to time to identify short-term investment opportunities that are derived from fundamental, quantitative, technical or event-driven techniques on a 0-3 month time horizon and which may differ from our long-term investment rating. HSBC has assigned ratings for its long-term investment opportunities as described below.

This report addresses only the long-term investment opportunities of the companies referred to in the report. As and when HSBC publishes a short-term trading idea the stocks to which these relate are identified on the website. Details of these short-term investment opportunities can be found under the Reports section of this website.

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### **Stock (vs Global sector universe of companies under coverage by sector team)**

- ▶ Overweight (Buy)
- ▶ Neutral (Hold)
- ▶ Underweight (Sell)

HSBC assigns ratings to its stocks in this sector on the following basis:

For companies covered on a sector basis, we apply a ratings structure which ranks the stocks according to their notional target price vs current market price and then categorises (approximately) the top 40% as Overweight, the next 40% as Neutral and the last 20% as Underweight. The performance horizon is 2 years. The notional target price is defined as the mid-point of the analysts' valuation for a stock.

Prior to 15 November 2004, HSBC's ratings system was based upon a two-stage recommendation structure: a combination of the analysts' view on the stock relative to its sector and the sector call relative to the market, together giving a view on the stock relative to the market. The sector call was the responsibility of the strategy team, set in co-operation with the analysts. For other companies, HSBC showed a recommendation relative to the market. The performance horizon was 6-12 months. The target price was the level the stock should have traded at if the market accepted the analysts' view of the stock.

From 15 November 2004 to 7 June 2005, HSBC carried no ratings and concentrated on long-term thematic reports which identified themes and trends in industries, but did not make a conclusion as to the investment action that potential investors should take.

## Rating distribution for long-term investment opportunities

As of 23 November 2005, the distribution of all ratings published is as follows:

<b>Overweight/Buy</b>	43%	(38% of these provided with Investment Banking Services)
<b>Neutral/Hold</b>	40%	(39% of these provided with Investment Banking Services)
<b>Underweight/Sell</b>	17%	(39% of these provided with Investment Banking Services)

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## Issuer & Analyst disclosures

### Disclosure checklist

Company	Ticker	Recent price	Disclosure
Medtronic Inc	MDT.N	56.57	6
Roche	ROG.VX	197.7	2, 3, 5, 6, 7

Source: HSBC

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