

Impact of Real-world Use of the CONTOUR®DIABETES App on Glycemic Control and Testing Frequency

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BACKGROUND AND OBJECTIVES

- Preliminary evidence suggests a link between regular review of blood glucose (BG) using mobile phone application (app) technology and improved glycemic control in diabetes (12-week observational study in 51 type 1 and type 2 diabetes patients)¹
- The CONTOUR®NEXT ONE smart meter and app system (Ascensia Diabetes Care, Parsippany, NJ, USA) consists of a wireless-enabled BG meter, linked to the CONTOUR®DIABETES mobile app
- The app, developed in accordance with the well-researched Information-Motivation-Behavioral Skills (IMB) model,²⁻⁵ reports patterns of BG readings to the app user (**Figure 1a**) and provides guidance for diabetes self-management (**Figure 1b**)
 - Data from a randomized controlled trial³ and a survey of diabetes patients⁴ demonstrate that direct patient insights into BG patterns can have a beneficial effect on health behavior and positively influence glycemic outcomes in people with diabetes
- We aimed, through analysis of real-world data, to determine the effects of using the CONTOUR®DIABETES app on:
 - Change in frequency of BG testing among users
 - Change in frequency of hypoglycemic and hyperglycemic events

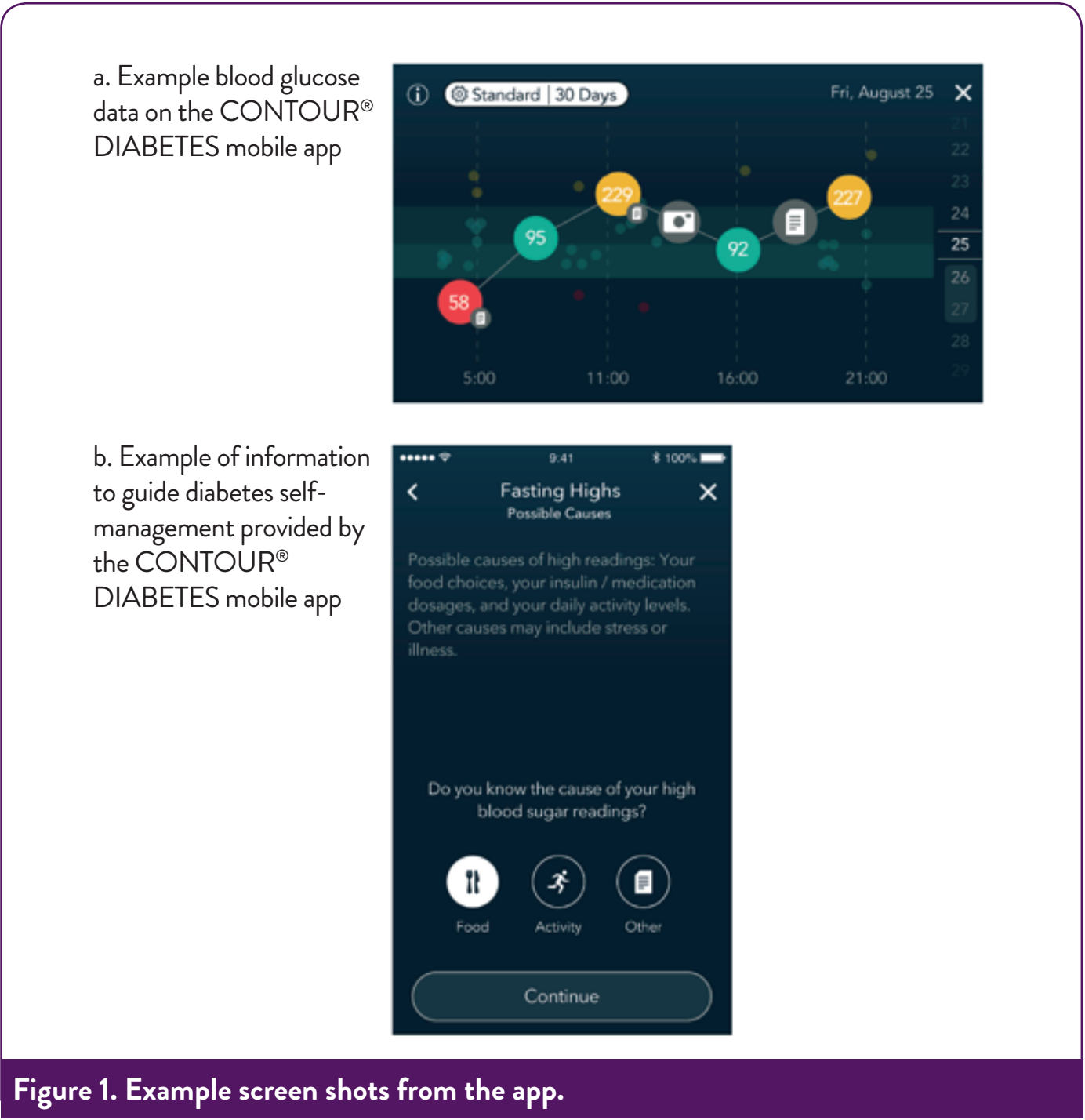


Figure 1. Example screen shots from the app.

METHODS

Dataset

- Data were obtained from users of a commercially available BG monitoring system
 - Users of the CONTOUR®NEXT ONE smart meter voluntarily downloaded the CONTOUR®DIABETES mobile app to their mobile device and chose to store data collected in the CONTOUR®DIABETES mobile app in the CONTOUR®CLOUD database. Anonymized data from the CONTOUR®CLOUD database were used for the analysis
 - No demographic data, or data relating to user diagnosis or treatment were collected
- Anonymized data (BG readings) from 5,870 North American app users with >180 days of app use were analyzed (**Table 1**)
- Changes in the frequency of hypoglycemia and hyperglycemia were estimated in app users that experienced low and high BG readings within the first 30 days and after >180 days
 - Group A (n=1,253) defined hypoglycemia as <70 mg/dL and hyperglycemia as >180 mg/dL
 - Group B (n=654) used more stringent definitions: hypoglycemia, <50 mg/dL; hyperglycemia, >250 mg/dL
 - Subsets of groups A and B who experienced multiple (≥3 or ≥5) hypoglycemic and hyperglycemic events were also identified (**Table 1**)

Table 1. Datasets		
Dataset	Criteria	N
All data analyzed	Users with >180 days of app use	5,870
Group A	≥1 BG reading of hypoglycemia (<70 mg/dL) and hyperglycemia (>180 mg/dL)	1,253
Repeat events subset (≥3 events)	≥3 hypoglycemia (<70 mg/dL) BG readings	782
	≥3 hyperglycemia (>180 mg/dL) BG readings	1,126
Repeat events subset (≥5 events)	≥5 hypoglycemia (<70 mg/dL) BG readings	611
	≥5 hyperglycemia (>180 mg/dL) BG readings	1,043
Group B	≥1 BG reading of hypoglycemia (<50 mg/dL) and hyperglycemia (>250 mg/dL)	654
Repeat events subset (≥3 events)	≥3 hypoglycemia (<50 mg/dL) BG readings	361
	≥3 hyperglycemia (>250 mg/dL) BG readings	585
Repeat events subset (≥5 events)	≥5 hypoglycemia (<50 mg/dL) BG readings	261
	≥5 hyperglycemia (>250 mg/dL) BG readings	532

BG, blood glucose.

Data analysis

- Daily testing frequency was estimated for all users with >180 days app use (n=5,870), using analysis of variance (ANOVA)
 - The frequency of app use in the first 30 days was compared with the frequency after >180 days
- Odds ratios (OR) were used to estimate changes in the frequency of hypoglycemia and hyperglycemia associated with >180 days of app use (for information on OR, see **Figure 2**)

OR explained

OR estimation

- Odds predict the likelihood of event occurrence
- The odds for a hypoglycemic or hyperglycemic BG reading were estimated for two conditions:
 - In the first 30 days of app use*
 - After >180 days of app use†
- The OR is the relative difference in the likelihood of event occurrence between the two conditions (odds for an event in the first 30 days/odds for an event after >180 days)

OR interpretation

- If the OR = 1**, the estimated likelihood of event occurrence is the same for both conditions
- If the OR is >1**, the condition corresponding to the numerator (odds for an event in the first 30 days) has a greater likelihood than the condition corresponding to the denominator (odds after >180 days)
 - Therefore an OR >1 indicates a benefit (a lower predicted frequency of glucose excursions) is associated with app use
- The 95% CI** indicates the level of certainty in the data
 - A wider CI = a lower level of certainty
 - If both the upper and lower 95% CI limits are >1 there is a minimum 95% (i.e. statistically significant) confidence that the odds for event occurrence associated with app use of >180 days are lower than the odds in the first 30 days

*Total number of events in first 30 days/total number of BG readings performed by the user in the first 30 days
†Total number of events after >180 days/total number of BG readings performed by the user after >180 days
BG, blood glucose; CI, confidence interval; OR, odds ratio.

Figure 2. Information on OR.

RESULTS

- A statistically significant increase in BG testing frequency was associated with app use
 - Testing frequency after 180 days increased to 4.48 times daily compared with 2.03 times daily in the first 30 days (p<0.0001)
- A statistically significant decrease in the estimated risk of experiencing ≥1 hypoglycemic or hyperglycemic event was associated with >180 days of app use, using both the less (Group A, **Figure 3a**) and more (Group B, **Figure 3b**) stringent definitions of hypoglycemia and hyperglycemia

- Compared with the first 30 days of app use
 - Group B had a more than 2-fold decrease in the estimated risk of experiencing ≥1 hypoglycemic event (<50 mg/dL) after >180 days of app use (OR: 2.47 [95% CI 2.02–3.07]; **Figure 3b**)
 - Group B had a more than 1.5-fold decrease in the estimated risk of experiencing ≥1 hyperglycemic event (>250 mg/dL) after >180 days of app use (OR: 1.56 [95% CI 1.32–1.91]; **Figure 3b**)
 - Compared with Group B, Group A had similar reductions in the estimated risk of experiencing ≥1 hypoglycemic or hyperglycemic event (defined as <50 mg/dL and >180 mg/dL, respectively) after >180 days of app use (**Figure 3a**)
 - In both groups, the estimated risk of experiencing ≥3 or ≥5 events per user was consistently lower after >180 days of app use (**Figure 3a and 3b**)

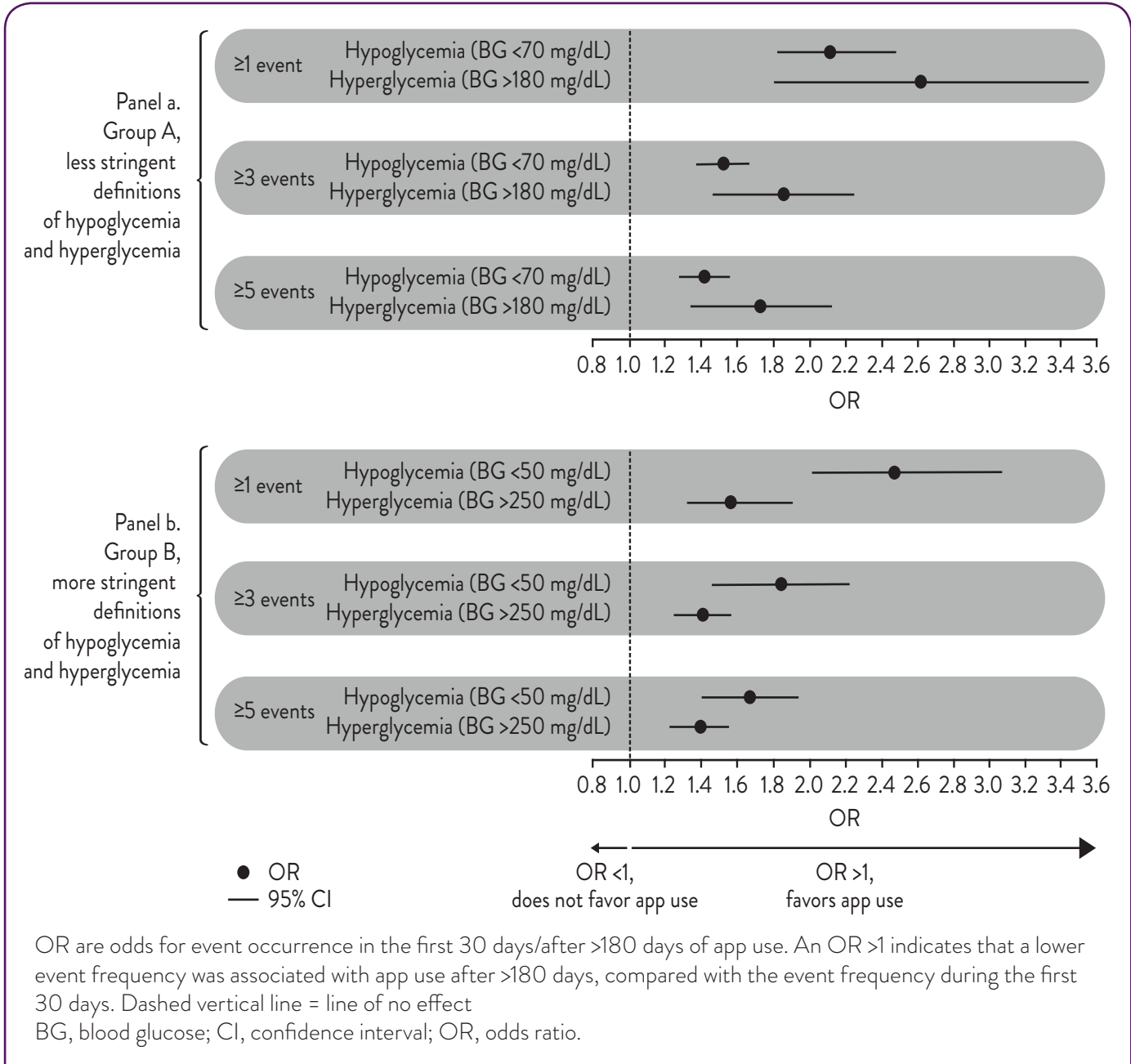


Figure 3. Change in the estimated risk of hypoglycemia and hyperglycemia associated with app use in a. Group A and b. Group B.

CONCLUSIONS

- Engagement with diabetes management increased over time, as demonstrated by more frequent BG testing at >180 days versus 30 days among app users
- App use for >180 days was associated with a reduced frequency of both hypoglycemic and hyperglycemic events
- These results support that use of the CONTOUR®DIABETES mobile app facilitates active involvement of patients in diabetes self-management, which may lead to improved glycemic control

References

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