

# Text Message Reminders Boost Teen Vaccination

VITALS

**Major Finding:** Adolescents whose parents were sent personalized text messages reminding them that their child needed vaccines were 2.5 times more likely to receive the MCV4 vaccine, the Tdap vaccine, or both.

**Data Source:** A randomized trial among 361 low-income urban adolescents and their parents.

**Disclosures:** Dr. Stockwell reported that she had no financial conflicts, but that one of the study's investigators is on an advisory board for and has received research funding from Merck.

BY SUSAN LONDON

FROM THE ANNUAL MEETING OF THE PEDIATRIC ACADEMIC SOCIETIES

VANCOUVER, B.C. — Text messages reminding parents that their adolescents need vaccines are an effective and efficient means of improving immunization rates in this popu-

lation, according to findings of a randomized trial.

Adolescents whose parents were sent automated, personalized text message reminders that included walk-in times for vaccination were 2.5 times more likely to receive the meningococcal conjugate (MCV4) vaccine, the tetanus-diphtheria-pertussis (Tdap) vaccine, or both.

The observed gains in immunization rates were greater than those seen previously with reminder and recall strategies, lead investigator Dr. Melissa S. Stockwell said.

In fact, this strategy works so well that busy clinics with many competing priorities will need to be prepared to meet the increased demand for vaccines.

"The actual texting is instantaneous and fast, but you have the repercussions of bringing all those kids in," she explained. One option is to stagger the messages to control the numbers of adolescents who might show up at one time.

The trial was conducted in six networked primary care practices in New York City among parents who had a child aged 11-18 years needing the MCV4 vaccine, the Tdap vaccine, or both, and had a cell phone number in the system. The practices were randomized to a control (usual care) group or an intervention (Text4Health) group.

In intervention practices, parents were sent text message reminders that were automatically generated using data from a linked immunization registry. The reminders were sent up to five times over a 7-week period until the adolescent had received the two target vaccines.

"Based on our focus group [of parents], they really wanted the messages to be personal," said Dr. Stockwell, a pediatrician at Columbia University in New York. So the messages included their child's name, their clinic's name, and walk-in times for vaccination, plus offered the option of switching between English and Spanish.

Study results reported in a poster were based on 195 adolescents in the intervention group and 166 in the control group. The adolescents were 16 years old on average, 55% were Hispanic, and 80% had public health insurance.

In the intervention group, 821 text messages were sent. Just 6% of parents were found to have wrong numbers, and 3% opted out of receiving the messages.

At 24 weeks, adolescents in the intervention group had a higher rate of receipt of the MCV4 vaccine, Tdap vaccine, or both, compared with their peers in the control group (35% vs. 17%)—for a significant difference between groups of 18%. After adjustment for potential confounders, the intervention was associated with 2.5-fold higher odds of receiving these vaccines.

Adolescents in the intervention group also had a higher rate of receipt of any other needed vaccines, such as the human papillomavirus vaccine and the hepatitis A vaccine (42% vs. 29.5%), with a difference between groups of 12.5%.

The estimated cost of the intervention, assuming that it was sustained for 2 years in a hypothetical cohort of 100,000 adolescents, was \$1.71 per adolescent immunized and \$0.42 per additional vaccine delivered.

A text message "stays on the phone, so it might sort of be a constant reminder, or the information—especially the walk-in times—is right there so they can send their child at that time," she said. ■

## Levemir® (insulin detemir [rDNA origin] injection)

### Rx ONLY

#### BRIEF SUMMARY. Please see package insert for full prescribing information.

**INDICATIONS AND USAGE:** LEVEMIR® is indicated for once- or twice-daily subcutaneous administration for the treatment of adult and pediatric patients with type 1 diabetes mellitus or adult patients with type 2 diabetes mellitus who require basal (long acting) insulin for the control of hyperglycemia.

**CONTRAINDICATIONS:** LEVEMIR® is contraindicated in patients hypersensitive to insulin detemir or one of its excipients.

**WARNINGS:** Hypoglycemia is the most common adverse effect of insulin therapy, including LEVEMIR®. As with all insulins, the timing of hypoglycemia may differ among various insulin formulations. Glucose monitoring is recommended for all patients with diabetes. LEVEMIR® is not to be used in insulin infusion pumps. Any change of insulin dose should be made cautiously and only under medical supervision. Changes in insulin strength, timing of dosing, manufacturer, type (e.g., regular, NPH, or insulin analogs), species (animal, human), or method of manufacture (rDNA versus animal-source insulin) may result in the need for a change in dosage. Concomitant oral antidiabetic treatment may need to be adjusted. Needles and LEVEMIR® FlexPen® must not be shared.

**PRECAUTIONS: General:** Inadequate dosing or discontinuation of treatment may lead to hyperglycemia and, in patients with type 1 diabetes, diabetic ketoacidosis. The first symptoms of hyperglycemia usually occur gradually over a period of hours or days. They include nausea, vomiting, drowsiness, flushed dry skin, dry mouth, increased urination, thirst and loss of appetite as well as acetone breath. Untreated hyperglycemic events are potentially fatal. LEVEMIR® is not intended for intravenous or intramuscular administration. The prolonged duration of activity of insulin detemir is dependent on injection into subcutaneous tissue. Intravenous administration of the usual subcutaneous dose could result in severe hypoglycemia. Absorption after intramuscular administration is both faster and more extensive than absorption after subcutaneous administration. LEVEMIR® should not be diluted or mixed with any other insulin preparations (see PRECAUTIONS, Mixing of Insulins). Insulin may cause sodium retention and edema, particularly if previously poor metabolic control is improved by intensified insulin therapy. Lipodystrophy and hypersensitivity are among potential clinical adverse effects associated with the use of all insulins. As with all insulin preparations, the time course of LEVEMIR® action may vary in different individuals or at different times in the same individual and is dependent on site of injection, blood supply, temperature, and physical activity. Adjustment of dosage of any insulin may be necessary if patients change their physical activity or their usual meal plan. **Hypoglycemia:** As with all insulin preparations, hypoglycemic reactions may be associated with the administration of LEVEMIR®. Hypoglycemia is the most common adverse effect of insulins. Early warning symptoms of hypoglycemia may be different or less pronounced under certain conditions, such as long duration of diabetes, diabetic nerve disease, use of medications such as beta-blockers, or intensified diabetes control (see PRECAUTIONS, Drug Interactions). Such situations may result in severe hypoglycemia (and, possibly, loss of consciousness) prior to patients' awareness of hypoglycemia. The time of occurrence of hypoglycemia depends on the action profile of the insulins used and may, therefore, change when the treatment regimen or timing of dosing is changed. In patients being switched from other intermediate or long-acting insulin preparations to once- or twice-daily LEVEMIR®, dosages can be prescribed on a unit-to-unit basis; however, as with all insulin preparations, dose and timing of administration may need to be adjusted to reduce the risk of hypoglycemia. **Renal Impairment:** As with other insulins, the requirements for LEVEMIR® may need to be adjusted in patients with renal impairment. **Hepatic Impairment:** As with other insulins, the requirements for LEVEMIR® may need to be adjusted in patients with hepatic impairment. **Injection Site and Allergic Reactions:** As with any insulin therapy, lipodystrophy may occur at the injection site and delay insulin absorption. Other injection site reactions with insulin therapy may include redness, pain, itching, hives, swelling, and inflammation. Continuous rotation of the injection site within a given area may help to reduce or prevent these reactions. Reactions usually resolve in a few days to a few weeks. On rare occasions, injection site reactions may require discontinuation of LEVEMIR®. In some instances, these reactions may be related to factors other than insulin, such as irritants in a skin cleansing agent or poor injection technique. **Systemic allergy:** Generalized allergy to insulin, which is less common but potentially more serious, may cause rash (including pruritus) over the whole body, shortness of breath, wheezing, reduction in blood pressure, rapid pulse, or sweating. Severe cases of generalized allergy, including anaphylactic reaction, may be life-threatening. **Intercurrent Conditions:** Insulin requirements may be altered during intercurrent conditions such as illness, emotional disturbances, or other stresses. **Information for Patients:** LEVEMIR® must only be used if the solution appears clear and colorless with no visible particles. Patients should be informed about potential risks and advantages of LEVEMIR® therapy, including the possible side effects. Patients should be offered continued education and advice on insulin therapies, injection technique, life-style management, regular glucose monitoring, periodic glycosylated hemoglobin testing, recognition and management of hypo- and hyperglycemia, adherence to meal planning, complications of insulin therapy, timing of dosage, instruction for use of injection devices and proper storage of insulin. Patients should be informed that frequent, patient-performed blood glucose measurements are needed to achieve effective glycemic control to avoid both hyperglycemia and hypoglycemia. Patients must be instructed on handling of special situations such as intercurrent conditions (illness, stress, or emotional disturbances), an inadequate or skipped insulin dose, inadvertent administration of an increased insulin dose, inadequate food intake, or skipped meals. Refer patients to the LEVEMIR® "Patient Information" circular for additional information. As with all patients who have diabetes, the ability to concentrate and/or react may be impaired as a result of hypoglycemia or hyperglycemia. Patients with diabetes should be advised to inform their health care professional if they are pregnant or are contemplating pregnancy (see PRECAUTIONS, Pregnancy). **Laboratory Tests:** As with all insulin therapy, the therapeutic response to LEVEMIR® should be monitored by periodic blood glucose tests. Periodic measurement of HbA<sub>1c</sub> is recommended for the monitoring of long-term glycemic control. **Drug Interactions:** A number of substances affect glucose metabolism and may require insulin dose adjustment and particularly close monitoring. The following are examples of substances that may reduce the blood-glucose-lowering effect of insulin: corticosteroids, danazol, diuretics, sympathomimetic agents (e.g., epinephrine, albuterol, terbutaline), isoniazid, phenothiazine derivatives, somatropin, thyroid hormones, estrogens, progestogens (e.g., in oral contraceptives). The following are examples of substances that may increase the blood-glucose-lowering effect of insulin and susceptibility to hypoglycemia: oral antidiabetic drugs, ACE inhibitors, disopyramide, fibrates, fluoxetine, MAO inhibitors, propoxyphene, salicylates, somatostatin analog (e.g., octreotide), and sulfonamide antibiotics. Beta-blockers, clonidine, lithium salts, and alcohol may either potentiate or weaken the

blood-glucose-lowering effect of insulin. Pentamidine may cause hypoglycemia, which may sometimes be followed by hyperglycemia. In addition, under the influence of sympatholytic medicinal products such as beta-blockers, clonidine, guanethidine, and reserpine, the signs of hypoglycemia may be reduced or absent. The results of *in-vitro* and *in-vivo* protein binding studies demonstrate that there is no clinically relevant interaction between insulin detemir and fatty acids or other protein bound drugs. **Mixing of Insulins:** If LEVEMIR® is mixed with other insulin preparations, the profile of action of one or both individual components may change. Mixing LEVEMIR® with insulin aspart, a rapid acting insulin analog, resulted in about 40% reduction in AUC<sub>(0-2h)</sub> and C<sub>max</sub> for insulin aspart compared to separate injections when the ratio of insulin aspart to LEVEMIR® was less than 50%. LEVEMIR® should NOT be mixed or diluted with any other insulin preparations. **Carcinogenicity, Mutagenicity, Impairment of Fertility:** Standard 2-year carcinogenicity studies in animals have not been performed. Insulin detemir tested negative for genotoxic potential in the *in-vitro* reverse mutation study in bacteria, human peripheral blood lymphocyte chromosome aberration test, and the *in-vivo* mouse micronucleus test. **Pregnancy: Teratogenic Effects: Pregnancy Category C:** In a fertility and embryonic development study, insulin detemir was administered to female rats before mating, during mating, and throughout pregnancy at doses up to 300 nmol/kg/day (3 times the recommended human dose, based on plasma Area Under the Curve (AUC) ratio). Doses of 150 and 300 nmol/kg/day produced numbers of litters with visceral anomalies. Doses up to 900 nmol/kg/day (approximately 135 times the recommended human dose based on AUC ratio) were given to rabbits during organogenesis. Drug-dose related increases in the incidence of fetuses with gall bladder abnormalities such as small, bilobed, bifurcated and missing gall bladders were observed at a dose of 900 nmol/kg/day. The rat and rabbit embryofetal development studies that included concurrent human insulin control groups indicated that insulin detemir and human insulin had similar effects regarding embryotoxicity and teratogenicity. **Nursing mothers:** It is unknown whether LEVEMIR® is excreted in significant amounts in human milk. For this reason, caution should be exercised when LEVEMIR® is administered to a nursing mother. Patients with diabetes who are lactating may require adjustments in insulin dose, meal plan, or both. **Pediatric use:** In a controlled clinical study, HbA<sub>1c</sub> concentrations and rates of hypoglycemia were similar among patients treated with LEVEMIR® and patients treated with NPH human insulin. **Geriatric use:** Of the total number of subjects in intermediate and long-term clinical studies of LEVEMIR®, 85 (type 1 studies) and 363 (type 2 studies) were 65 years and older. No overall differences in safety or effectiveness were observed between these subjects and younger subjects, and other reported clinical experience has not identified differences in responses between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out. In elderly patients with diabetes, the initial dosing, dose increments, and maintenance dosage should be conservative to avoid hypoglycemic reactions. Hypoglycemia may be difficult to recognize in the elderly.

**ADVERSE REACTIONS:** Adverse events commonly associated with human insulin therapy include the following: **Body as Whole:** allergic reactions (see PRECAUTIONS, Allergy). **Skin and Appendages:** lipodystrophy, pruritus, rash. Mild injection site reactions occurred more frequently with LEVEMIR® than with NPH human insulin and usually resolved in a few days to a few weeks (see PRECAUTIONS, Allergy). **Other: Hypoglycemia:** (see WARNINGS and PRECAUTIONS). In trials of up to 6 months duration in patients with type 1 and type 2 diabetes, the incidence of severe hypoglycemia with LEVEMIR® was comparable to the incidence with NPH, and, as expected, greater overall in patients with type 1 diabetes (Table 4). **Weight gain:** In trials of up to 6 months duration in patients with type 1 and type 2 diabetes, LEVEMIR® was associated with somewhat less weight gain than NPH (Table 4). Whether these observed differences represent true differences in the effects of LEVEMIR® and NPH insulin is not known, since these trials were not blinded and the protocols (e.g., diet and exercise instructions and monitoring) were not specifically directed at exploring hypotheses related to weight effects of the treatments compared. The clinical significance of the observed differences has not been established.

Table 4: Safety Information on Clinical Studies\*

Treatment	# of subjects	Weight (kg)		Hypoglycemia (events/subject/month)	
		Baseline	End of treatment	Major**	Minor***
<b>Type 1</b>					
	Study A	LEVEMIR® N=276	75.0	75.1	0.045
	NPH N=133	75.7	76.4	0.035	3.063
Study C	LEVEMIR® N=492	76.5	76.3	0.029	2.397
	NPH N=257	76.1	76.5	0.027	2.564
Study D	LEVEMIR® N=232	N/A	N/A	0.076	2.677
	Pediatric NPH N=115	N/A	N/A	0.083	3.203
<b>Type 2</b>					
	Study E	LEVEMIR® N=237	82.7	83.7	0.001
	NPH N=239	82.4	85.2	0.006	0.595
Study F	LEVEMIR® N=195	81.8	82.3	0.003	0.193
	NPH N=200	79.6	80.9	0.006	0.235
* See CLINICAL STUDIES section for description of individual studies					
** Major = requires assistance of another individual because of neurologic impairment					
*** Minor = plasma glucose <56 mg/dl, subject able to deal with the episode him/herself					

**OVERDOSAGE:** Hypoglycemia may occur as a result of an excess of insulin relative to food intake, energy expenditure, or both. Mild episodes of hypoglycemia usually can be treated with oral glucose. Adjustments in drug dosage, meal patterns, or exercise may be needed. More severe episodes with coma, seizure, or neurologic impairment may be treated with intramuscular/subcutaneous glucagon or concentrated intravenous glucose. After apparent clinical recovery from hypoglycemia, continued observation and additional carbohydrate intake may be necessary to avoid recurrence of hypoglycemia.

More detailed information is available upon request.

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insulin detemir (rDNA origin) injection