

Technology, Cost Shift Hospital Care to Home

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FROM THE SWEDISH MEDICAL CENTER SYMPOSIUM "INNOVATION IN THE AGE OF REFORM"

SEATTLE – Home health care will increasingly replace hospital care, panelists said during a discussion of the phenomenon at the symposium.

They weren't just talking about lower-intensity care, either. Consider the work

of panelist Dr. Bruce Leff and his colleagues at Johns Hopkins University in Baltimore, who are among those developing and disseminating the "Hospital at Home" care model. It's about "true acute care," he said, "taking someone from the emergency department [where a] physician has said 'this person needs to be admitted'" and treating that person at home. The "best way this works is when the 'Hospital at Home' is thought of as

a virtual unit of the acute hospital. Recently, we've been partnering with proto-ACOs [accountable care organizations] that are very interested in this model," said Dr. Leff, a Hopkins geriatrician.

Several things are driving the trend. First, payers are looking to cut costs by cutting hospital admissions. Also, hospital executives want to empty their beds of patients on whom they lose money; patients generally prefer treatment at home;

elderly patients usually do better there; and technology increasingly enables hospital-level home care, panelists said. Hospitals are already being built with fewer beds than they might have had a decade ago. A \$1 billion high-tech tower being built at Johns Hopkins won't add any more beds to the campus, Dr. Leff noted.

Given the trend, if hospitals aren't thinking about how to focus on high-margin patients and effectively treat others in lower-cost settings, "they're dead; they're gone," he said.

The trend toward home care has been embraced by one of the nation's largest health care companies, Louisville, Ky.-based Kindred Healthcare Inc., according to CEO Paul Diaz, also a panelist. "We are increasingly investing in home care because 40% of our discharges are going to home care" already.



The 'Hospital at Home' works best when it's thought of as a virtual unit of the acute hospital.

DR. LEFF

He and others said they think technology will further the trend. Diane Cook, Ph.D., a professor of electrical engineering who was also a panelist, gave an example of what could be coming soon. She and her colleagues at Washington State University, Pullman, have rigged an apartment on campus with sensors (motion detectors, for instance, and stove-burner monitors) to see if the feedback accurately indicates how well patients – especially the elderly – perform day-to-day tasks, and if they need intervention. If the technology proves itself, it could reduce unnecessary home-health visits, saving providers time and money.

Dr. Cook and her colleagues ultimately envision "a lightweight, simple package caregivers can purchase from Home Depot or Lowe's" that would be capable of remote, hospital-level monitoring. The idea is to empower patients to "do as much as they can at home," she said.

Meanwhile, Dr. Leff and his colleagues are planning to pilot an adhesive strip-like sensor that could be used in the home. It "gives you everything you get in the ICU now, with 14 different probes and needles," he said. "Hospital at Home" is already "a pretty intense intervention" that can include IV medications; oxygen and respiratory therapy; and x-rays, ultrasounds, and diagnostic labs, among other things, Dr. Leff said.

Dr. Leff said he has no personal conflicts of interest. His research is supported in part by fees paid to Johns Hopkins for his consulting services. Dr. Cook said she did not currently have any disclosures.

For more information about "Hospital at Home," visit www.hospitalathome.org/DGM/hah.

Hypertriglyceridemia: Patients with fasting serum TG levels above 500 mg/dL were excluded from the diabetes clinical trials. In the phase 3 diabetes trials, 637 (63%) patients had baseline fasting serum TG levels less than 200 mg/dL, 261 (25%) had baseline fasting serum TG levels between 200 and 300 mg/dL, 111 (11%) had baseline fasting serum TG levels between 300 and 500 mg/dL, and 9 (1%) had fasting serum TG levels greater than or equal to 500 mg/dL. The median baseline fasting TG concentration for the study population was 172 mg/dL; the median post-treatment fasting TG was 195 mg/dL in the WELCHOL group and 177 mg/dL in the placebo group. WELCHOL therapy resulted in a median placebo-corrected increase in serum TG of 5% (p=0.22), 22% (p<0.001), and 18% (p<0.001) when added to metformin, insulin and sulfonylureas, respectively [See *Warnings and Precautions (5.2) and Clinical Studies (14.2) in the full prescribing information*]. In comparison, WELCHOL resulted in a median increase in serum TG of 5% compared to placebo (p=0.42) in a 24-week monotherapy lipid-lowering trial [See *Clinical Studies (14.1) in the full prescribing information*].

Treatment-emergent fasting TG concentrations \geq 500 mg/dL occurred in 4.1% of WELCHOL-treated patients compared to 2.0% of placebo-treated patients. Among these patients, the TG concentrations with WELCHOL (median 604 mg/dL; interquartile range 538-712 mg/dL) were similar to that observed with placebo (median 644 mg/dL; interquartile range 574-724 mg/dL). Two (0.4%) patients on WELCHOL and 2 (0.4%) patients on placebo developed TG elevations \geq 1000 mg/dL. In all WELCHOL clinical trials, including studies in patients with type 2 diabetes and patients with primary hyperlipidemia, there were no reported cases of acute pancreatitis associated with hypertriglyceridemia. It is unknown whether patients with more uncontrolled, baseline hypertriglyceridemia would have greater increases in serum TG levels with WELCHOL [See *Contraindications (4) and Warnings and Precautions (5.2)*].

Cardiovascular adverse events: During the diabetes clinical trials, the incidence of patients with treatment-emergent serious adverse events involving the cardiovascular system was 3% (17/566) in the WELCHOL group and 2% (10/562) in the placebo group. These overall rates included disparate events (e.g., myocardial infarction, aortic stenosis, and bradycardia); therefore, the significance of this imbalance is unknown.

Hypoglycemia: Adverse events of hypoglycemia were reported based on the clinical judgment of the blinded investigators and did not require confirmation with fingerstick glucose testing. The overall reported incidence of hypoglycemia was 3.0% in patients treated with WELCHOL and 2.3% in patients treated with placebo. No WELCHOL treated patients developed severe hypoglycemia.

6.2 Post-marketing Experience

The following additional adverse reactions have been identified during post-approval use of WELCHOL. Because these reactions are reported voluntarily from a population of uncertain size, it is generally not possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

Drug Interactions with concomitant WELCHOL administration include:

- Increased seizure activity or decreased phenytoin levels in patients receiving phenytoin. Phenytoin should be administered 4 hours prior to WELCHOL.
- Reduced International Normalized Ratio (INR) in patients receiving warfarin therapy. In warfarin-treated patients, INR should be monitored frequently during WELCHOL initiation then periodically thereafter.
- Elevated thyroid-stimulating hormone (TSH) in patients receiving thyroid hormone replacement therapy. Thyroid hormone replacement should be administered 4 hours prior to WELCHOL [See *Drug Interactions (7)*].

Gastrointestinal Adverse Reactions

Bowel obstruction (in patients with a history of bowel obstruction or resection), dysphagia or esophageal obstruction (occasionally requiring medical intervention), fecal impaction, pancreatitis, abdominal distension, exacerbation of hemorrhoids, and increased transaminases.

Laboratory Abnormalities

Hypertriglyceridemia

7 DRUG INTERACTIONS

Table 4 lists the drugs that have been tested in *in vitro* binding or *in vivo* drug interaction studies with colesesevelam and/or drugs with postmarketing reports consistent with potential drug-drug interactions. Orally administered drugs that have not been tested for interaction with colesesevelam, especially those with a narrow therapeutic index, should also be administered at least 4 hours prior to WELCHOL. Alternatively, the physician should monitor drug levels of the co-administered drug.

**Table 4
Drugs Tested in *In Vitro* Binding or *In Vivo* Drug Interaction Testing or With Post-Marketing Reports**

Drugs with a known interaction with colesesevelam ^a	cyclosporine ^c , glyburide ^a , levothyroxine ^a , and oral contraceptives containing ethinyl estradiol and norethindrone
Drugs with postmarketing reports consistent with potential drug-drug interactions when coadministered with WELCHOL	phenytoin ^a , warfarin ^b
Drugs that do not interact with colesesevelam based on <i>in vitro</i> or <i>in vivo</i> testing	cephalexin, ciprofloxacin, digoxin, warfarin ^b , fenofibrate, lovastatin, metformin, metoprolol, pioglitazone, quinidine, repaglinide, valproic acid, verapamil

^a Should be administered at least 4 hours prior to WELCHOL

^b No significant alteration of warfarin drug levels with warfarin and WELCHOL coadministration in an *in vivo* study which did not evaluate warfarin pharmacodynamics (INR). [See *Post-marketing Experience (6.2)*]

^c Cyclosporine levels should be monitored and, based on theoretical grounds, cyclosporine should be administered at least 4 hours prior to WELCHOL.

In an *in vivo* drug interaction study, WELCHOL and warfarin coadministration had no effect on warfarin drug levels. This study did not assess the effect of WELCHOL and warfarin coadministration on INR. In postmarketing reports, concomitant use of WELCHOL and warfarin has been associated with reduced INR. Therefore, in patients on warfarin therapy, the INR should be monitored before initiating WELCHOL and frequently enough during early WELCHOL therapy to ensure that no significant alteration in INR occurs. Once the INR is stable, continue to monitor the INR at intervals usually recommended for patients on warfarin. [See *Post-marketing Experience (6.2)*]

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Pregnancy Category B. There are no adequate and well-controlled studies of colesesevelam use in pregnant women. Animal reproduction studies in rats and rabbits revealed no evidence of fetal harm. Requirements for vitamins and other nutrients are increased in pregnancy. However, the effect of colesesevelam on the absorption of fat-soluble vitamins has not been studied in pregnant women. This drug should be used during pregnancy only if clearly needed.

In animal reproduction studies, colesesevelam revealed no evidence of fetal harm when administered to rats and rabbits at doses 50 and 17 times the maximum human dose, respectively. Because animal reproduction studies are not always predictive of human response, this drug should be used in pregnancy only if clearly needed.

8.3 Nursing Mothers

Colesesevelam hydrochloride is not expected to be excreted in human milk because colesesevelam hydrochloride is not absorbed systemically from the gastrointestinal tract.

8.4 Pediatric Use

The safety and effectiveness of WELCHOL as monotherapy or in combination with a statin were evaluated in children, 10 to 17 years of age with heFH [See *Clinical Studies (14.1) in the full prescribing information*]. The adverse reaction profile was similar to that of patients treated with placebo. In this limited controlled study, there were no significant effects on growth, sexual maturation, fat-soluble vitamin levels or clotting factors in the adolescent boys or girls relative to placebo [See *Adverse Reactions (6.1)*].

Due to tablet size, WELCHOL for Oral Suspension is recommended for use in the pediatric population. Dose adjustments are not required when WELCHOL is administered to children 10 to 17 years of age. WELCHOL has not been studied in children younger than 10 years of age or in pre-menarchal girls.

8.5 Geriatric Use

Primary Hyperlipidemia: Of the 1350 patients enrolled in the hyperlipidemia clinical studies, 349 (26%) were \geq 65 years old, and 58 (4%) were \geq 75 years old. 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.

Type 2 Diabetes Mellitus: Of the 1128 patients enrolled in the four diabetes studies, 249 (22%) were \geq 65 years old, and 12 (1%) were \geq 75 years old. In these trials, WELCHOL 3.8 g/day or placebo was added onto background anti-diabetic therapy. No overall differences in safety or effectiveness were observed between the elderly and younger patients, but greater sensitivity of some older individuals cannot be ruled out.

8.6 Hepatic Impairment

No special considerations or dosage adjustments are recommended when WELCHOL is administered to patients with hepatic impairment.

8.7 Renal Impairment

Type 2 Diabetes Mellitus: Of the 1128 patients enrolled in the four diabetes studies, 696 (62%) had mild renal insufficiency (creatinine clearance [CrCl] 50- $<$ 80 mL/min), 53 (5%) had moderate renal insufficiency (CrCl 30- $<$ 50 mL/min), and none had severe renal insufficiency (CrCl $<$ 30 mL/min), as estimated from baseline serum creatinine using the Modification of Diet in Renal Disease (MDRD) equation. No overall differences in safety or effectiveness were observed between patients with CrCl $<$ 50 mL/min (n=53) and those with a CrCl \geq 50 mL/min (n=1075).

10 OVERDOSAGE

Doses of WELCHOL in excess of 4.5 g/day have not been tested. Because WELCHOL is not absorbed, the risk of systemic toxicity is low. However, excessive doses of WELCHOL may cause more severe local gastrointestinal effects (e.g., constipation) than recommended doses.

Welchol
(colesesevelam HCl)

Marketed by:

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07054

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