



ENDOCRINOLOGY OUTCOMES

2011

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The *UNIVERSITY OF COLORADO HOSPITAL DEPARTMENT OF ENDOCRINOLOGY* is made up of leading endocrinologists, nurses, researchers, and caregivers from a broad spectrum of related specialties. The collaborative care brought to patients every day includes diagnosis, education, and treatment for such endocrine-related conditions as: diabetes, menopause, osteoporosis, ovarian cancer, pancreatic cancer, pancreas transplant, pancreatitis, pituitary tumors, testicular cancer, thyroid cancer, and thyroid conditions. Endocrinology at the University of Colorado is backed by a long history of being among the first to bring new treatments to these complex conditions. The following pages highlight some of these accomplishments.

Diabetes: GLUCOSE CONTROL

Efforts pay off for patients

The endocrinology team is a bit like Goldilocks. But the specialists aren't looking for the right bed, they are looking for just the right level of glucose in patients in their beds—not too high and not too low.

"It's well documented that in almost every case, patients with high glucose do worse," says Michael McDermott, MD, endocrinology and diabetes practice director.

In 2005, McDermott and two diabetes nurses wrote protocols for controlling glucose in inpatients.

"Many approaches," he said, "can cause blood sugar to go too low, which can be just as damaging. We've really distinguished our program by controlling the highs and the lows in our patients."

Glucose management team

After writing the protocols, they then spent three years educating every nurse and every physician throughout every unit in the hospital on how to monitor and control glucose levels. In 2009, they formed a glucose management team that rounds and makes recommendations on all diabetic inpatients every day.

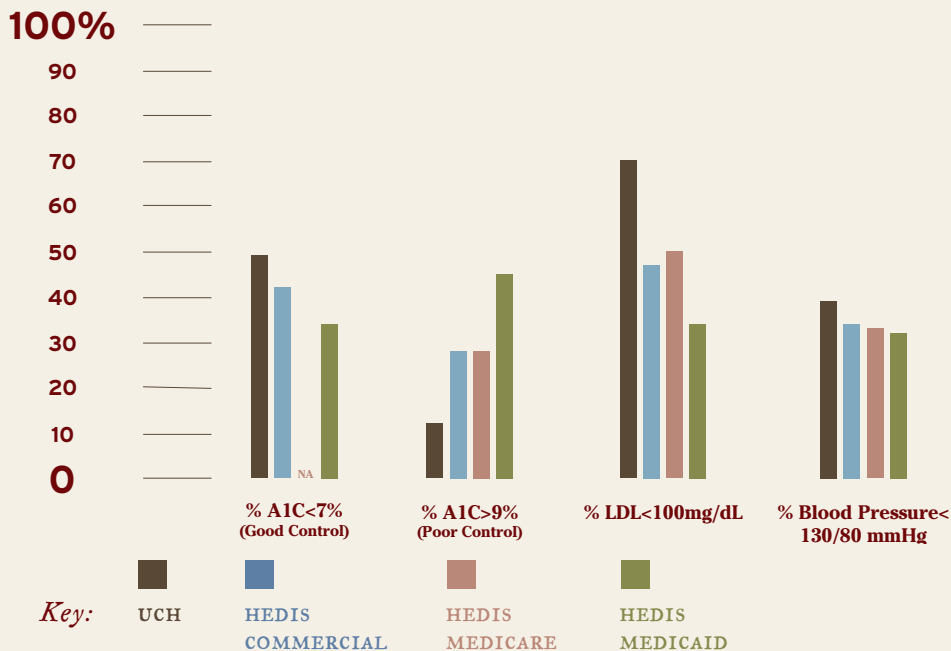
"We've improved by leaps and bounds to a very good record of inpatient glucose control," McDermott says.

The team's efforts extend to outpatients as well. The outpatient diabetes program offers one of

UCH OUTPATIENT DIABETES OUTCOMES

Comparison to 2010 HEDIS Report National Committee for Quality Assurance (NCQA)

UCH patients consistently rank far better in their disease management and control. 70% of UCH patients have an LDL of <100 and 49% have good control over their glucose levels.



HEDIS criteria includes patients with diabetes ages 18–75. UCH criteria includes patients with diabetes ALL ages. UCH data does not include labs performed outside UCH system (i.e. excludes Lab Corp, Quest). Data: OP PCC Summary & HEDIS 2010 Report.

the state's few American Diabetes Association-recognized Diabetes Self-Management Education Program. To receive this accreditation, which qualifies diabetes education programs for Medicare reimbursement, programs must submit three years of quality data and then re-apply every three years.

"I'm very proud to say we have extraordinarily good control of glucose in our patients," McDermott says. "But I'm most proud of the relationship our patients have with our team that leads people to feel

better about themselves and to work hard to keep themselves healthy."

University of Colorado contributions to diabetes care include:

- Discovery of the diabetes-related molecule that identifies if a person will develop juvenile diabetes
- Discovery of the single insulin gene that is crucial in the development of childhood, or Type 1, autoimmune diabetes in lab mice

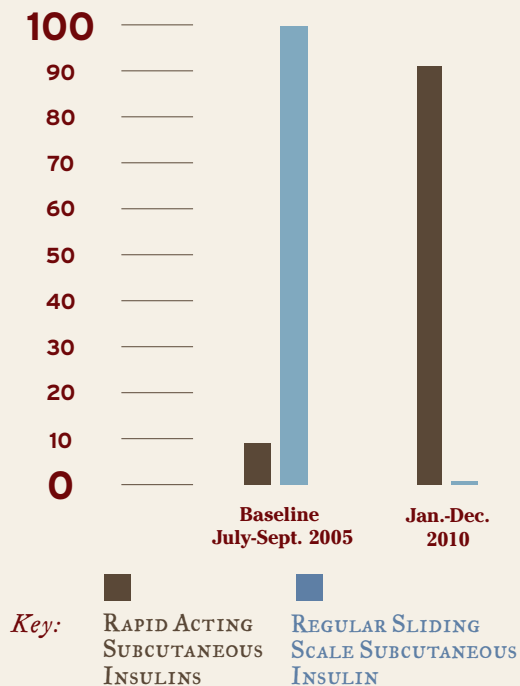
INPATIENT DIABETES & HYPER GLYCEMIC POPULATION TRENDING

University of Colorado Hospital Visits & LOS Versus CMS

	FY 2004/2005	FY 2005/2006	FY2006/2007	FY 2007/2008	FY 2008/2009	FY2009/2010
Primary DX Diabetes						
# Discharges	214	219	248	265	297	292
UCH LOS	4.44	5.18	5.18	4.6	3.77	3.76
CMS LOS	5.92	5.92	6.45	5.7	5.76	5.36
Secondary DX Diabetes						
# Discharges	2349	2524	2724	3005	3539	3735
UCH LOS	6.45	6.03	6.76	6.17	5.96	5.972
CMS LOS	6.61	6.47	6.73	6.76	6.59	6.595

UCH PERCENTAGES OF PATIENTS USING RAPID ACTING INSULIN:

Decrease Use of Regular Sliding Scale Insulin & Replace with Rapid Acting Insulin Meal & Correction Dosing



Thyroid: AVOIDING UNNECESSARY Surgery

Many indeterminate thyroid tumors no longer require diagnostic surgery

A novel molecular test developed with major leadership from the University of Colorado School of Medicine saved Emelia Johnson-Tabakoff from unnecessary thyroid surgery.

Johnson-Tabakoff was diagnosed with a rare form of ovarian cancer in the fall of 2010. After surgery, doctors wanted to start chemotherapy, but they had found a lump on her thyroid. As is the case in about 20-30 percent of patients with thyroid nodules, a needle biopsy was inconclusive.

"In the state I was in, I just wanted to cut it out," said Johnson-Tabakoff. "But if they did that, I couldn't start the chemotherapy."

Instead of surgery, her physicians referred her to the University of Colorado Hospital for a new molecular test performed on a non-surgical needle biopsy. That test, called the Afirma Thyroid FNA Analysis, showed the tumor was benign. Just weeks after her needle biopsy, Johnson-Tabakoff was started on chemotherapy.

"I finished therapy in November and I'm doing great," said the 61-year-old rancher in early December before leaving her part-time home in Denver to head back to her breeding ranch in Illinois. "That test really gave me peace of mind."

More than 500 thyroid cancer surgeries

The University of Colorado Hospital is one of the top thyroid cancer centers in the United States, and it has a unique joint thyroid oncology clinic staffed by both endocrinologists and oncologists.

Each year patients from throughout the Rocky Mountain region are referred to the program, often with advanced thyroid cancer or recurrent thyroid tumors. UCH performs more than 500 thyroid cancer surgeries each year.

The program was one of two lead national sites in the Afirma Thyroid FNA Analysis, which was released for commercial use by Veracyte Corporation in 2011.

The number of surgeries that may be averted due to this test is staggering. Approximately 50 percent of 60-year-old Americans have a thyroid nodule that is detected by an examination or imaging (ultrasound, CT scan). Chances are overwhelmingly good that it will be benign. A simple needle aspiration will prove that to be true in 60 percent of those patients.

Five to 10 percent of the patients will have cancer definitively diagnosed.

But 20 percent to 30 percent of patients will not have an answer after a needle biopsy. They will most likely be sent to surgery, where 70 percent to 80 percent will learn they don't have cancer.

"That's a lot of unnecessary surgery for possible cancer," says Bryan Haugen, MD, head of the Division of Endocrinology, Metabolism and Diabetes at the University of Colorado School of Medicine.

"Game changing"

Thyroidectomy has small but significant risks of voice box nerve damage or damaged parathyroids. And, in the case of complete thyroid removal, patients must take thyroid hormone medication throughout the rest of their lives.

"This is game changing in what we do," says Joshua Klopper, MD, an endocrinologist who specializes in thyroid tumor management at the University of Colorado Hospital. "This is a very reliable test that helps patients avoid surgery when the biopsy diagnosis is unclear."

The university's role in developing this molecular diagnostic test comes a decade after being a lead center

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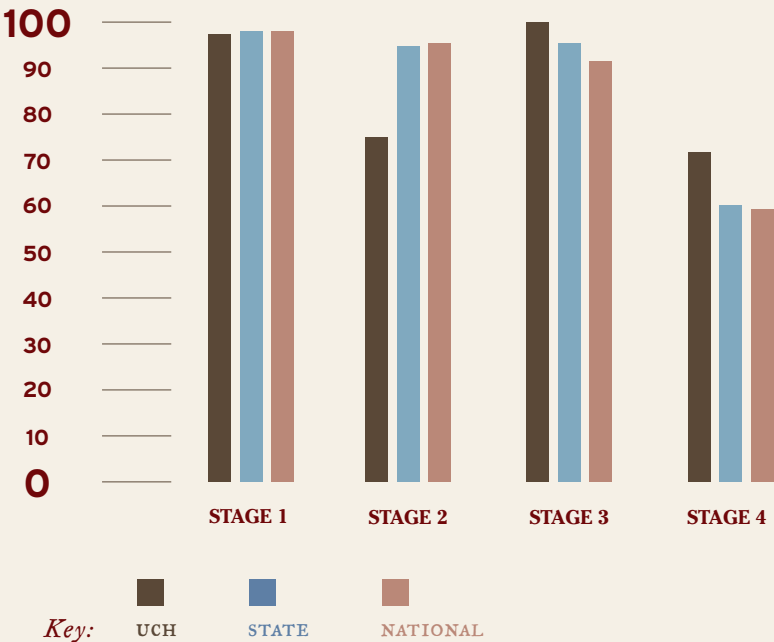
in clinical trials that led to the development of rhTSH, a genetically engineered thyroid stimulating hormone that allows doctors to destroy remaining thyroid gland tissue after thyroidectomy with radioactive iodine without having to withhold thyroid hormone medication.

Highlights of the thyroid tumor program at the University of Colorado Hospital include:

- Sensitive serum thyroglobulin testing.
- National experts in sensitive ultrasound examination of the neck and biopsies of abnormal tissue.
- National referral center for thyroid cancer surgery with >500 operations performed annually.
- Expertise in alcohol ablation (non-surgical destruction) of recurrent cancer for some patients who have had multiple neck surgeries.

- Nuclear medicine specialists who have expertise in radioiodine treatment using dosimetry—a special technique to calculate doses of radioiodine that are most effective and safest for the patient.
- Highly individualized computerized treatment planning for three-dimensional radiation treatment using IMRT (intensity modulated radiation therapy), which delivers the highest treatment dose to tumors while sparing normal tissue.
- Radiation therapists who are skilled in re-irradiation, if needed, and are also experts in stereotactic radiation.
- Access to many new treatments, including the latest treatments for thyroid cancer, through involvement in multiple clinical trials.

THYROID CANCER
5-YEAR SURVIVAL



AJCC 6TH EDITION

Pituitary: LIFELONG MANAGEMENT of patients requires multi-specialty effort

Patients with pituitary problems can often feel a bit like a hot potato. They start off seeing a pcp, are handed off to an endocrinologist, then perhaps a surgeon, and then, if they have a malignant tumor, perhaps to a neuro-oncologist.

For many patients, the care can be fragmented and they may be dropped after surgery, only to reappear years later with problems caused by lack of

normal hormone production that weren't caught after surgery.

"So many patients get treatment and they're lost to follow-up," says Kevin Lillehei, MD, director of the neuro-oncology program and a neurosurgeon at the University of Colorado Hospital. "Pituitary tumors are multispecialty endeavors that need to be followed up, often for life, even if benign."

Lillehei's is one of few pituitary programs in the nation that offers a combined endocrinology-neurosurgery approach to patients with pituitary problems. The center specializes in providing life-long management to patients with non-functioning pituitary tumors or hormone-secreting tumors resulting in Cushing's Disease and Acromegaly.

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2010 PITUITARY TUMOR SURGERIES IN COLORADO

(based on data collected by the Colorado Hospital Association)

University of Colorado Hospital	98	53.6%
Centura Health Penrose Hospital	16	8.7%
Exempla St Joseph Hospital	15	8.2%
Centura Health St Anthony Central	7	3.8%
Swedish Medical Center	7	3.8%
Boulder Community Hospital	5	2.7%
Centura Health Littleton Adventist Hospital	4	2.2%
Rose Medical Center	4	2.2%
St Marys Hospital & Medical Ctr	3	1.6%
Centura Health Porter Adventist	3	1.6%
Exempla Lutheran Medical Center	3	1.6%
Memorial Hospital	3	1.6%
Parker Adventist	3	1.6%
Medical Center of Aurora South	3	1.6%
Presbyterian St Luke's Medical	2	1.1%
Centura Health Avista Adventist	2	1.1%
Parkview Medical Center	1	0.5%
The Children's Hospital	1	0.5%
Valley View Hospital	1	0.5%
Exempla Good Samaritan	1	0.5%
Denver Health Medical Center	1	0.5%

Volumes

The highly specialized team also treats Craniopharyngiomas, Prolactinomas, and other tumors in the hypothalamic region. The endocrine group also cares for patients with hormone deficiencies and neuroendocrine tumors of the pancreas, adrenal and other sites.

Every year, more than 500 new patients from throughout the western United States are referred to the Joint Endocrine and Neurosurgery Pituitary Clinic.

One surgeon: More than 70 pituitary surgeries annually

Lillehei, a nationally recognized neurosurgeon, performs more than 70 pituitary surgeries annually. In the past 25 years, he has completed more than 1,200 surgeries.

“The majority of people in the United States with pituitary surgery are

operated on by a doctor who has performed less than 50 cases in his or her lifetime,” says Margaret Wierman, MD, director of the pituitary program. “Experience is a huge predictor of success in these cases. With many pituitary subtypes, surgery can be inadequate or fail.”

Ten years ago, Wierman and Lillehei together with Bette K. Kleinschmidt-DeMasters, MD, head of neuropathology, began a pituitary tumor tissue bank that has collected more than 300 samples. Using these samples, they have been able to identify the genes involved in pituitary tumorigenesis causing proliferation, migration and invasion.

“We consider ourselves hormone detectives,” says Wierman. “We find out what’s wrong, determine if it requires surgery and how we can correct all the hormonal abnormalities. We don’t stop until we find the answers for each patient.”

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The Pituitary Program at the University of Colorado Hospital is a multidisciplinary clinic with neuroendocrinologists, neurosurgeons, neuropathologists, radiation oncologists, and basic and clinical researchers. Program highlights include:

- *specialization in diagnostic strategies, administration of replacement hormones and medication to block hormone excess syndromes*
 - *more than 70 pituitary surgeries each year*
 - *stereotactic radiation for the treatment and management of invasive pituitary tumors and craniopharyngiomas using the Novalis Brain Lab™ system.*
 - *clinical trials for new drugs to treat Cushing’s disease, Acromegaly and Growth Hormone deficiency*
-

Exploration and Discovery

The Pituitary Program at the University of Colorado Hospital is one of the largest programs nationwide.

It is also involved in leading research into pituitary diseases and has contributed to many treatment advances in the field, including:

- Showed that alcohol ablation for Rathke's Cleft Cyst is not beneficial.
- Published first research showing radiation after surgery on pituitary macroadenoma is not necessary, helping to reduce unnecessary radiation for these patients.

It is currently involved in a number of clinical trials, including:

Hypopituitary Control and Complications Study

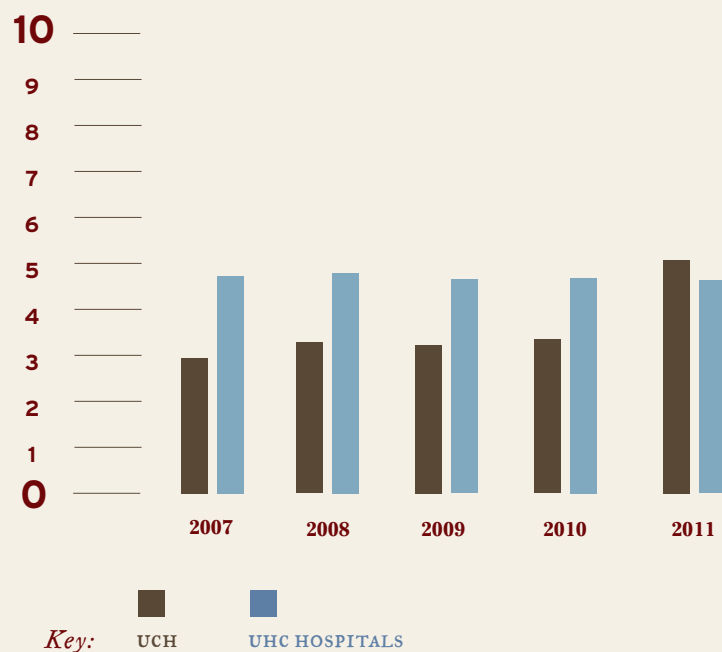
(HypoCCs): This is an on-going, observational study of patients with pituitary hormonal deficiencies and growth

hormone deficiency, who are either on or off growth hormone, to determine the long-term effects of growth hormone deficiency, and its treatment, on health and quality of life.

Understanding Pituitary Tumorigenesis: This study analyzes small pieces of pituitary tumors for their molecular gene profiles, compared to normal pituitary, to identify new markers for pituitary tumors and to identify novel candidates that may either cause or be targets for therapy of pituitary tumors in humans.

The Role of a Growth Factor, Wnt10a, in Pituitary Thyrotrope Cells: Pituitary cells that make thyroid-stimulating hormone (TSH) are called thyrotropes, and are critical for several aspects of normal human development and function. The goal of this study is to understand the role of a growth factor, Wnt-10a, in normal and abnormal thyrotrope cell growth.

COMPARISON OF PITUITARY PROCEDURES LENGTH OF STAY, DAYS



Data: University HealthSystem Consortium, 2011



**University of
Colorado Hospital**

ANSCHUTZ MEDICAL CAMPUS

*An enduring PASSION for EXPLORATION
in the pursuit of NEW DISCOVERIES.*

ENDOEXPLORERS.COM

UNIVERSITY OF COLORADO HOSPITAL is the Rocky Mountain region's *LEADING ACADEMIC MEDICAL CENTER*. It is recognized as the highest-performing academic hospital in the United States for delivering quality health care by the University HealthSystem Consortium, and is ranked as the best hospital in the Denver metro area and one of the best in the country by U.S. News & World Report. UCH is best known as an innovator in patient care and often as one of the first hospitals to bring new medicine to the patients' bedside. The hospital's physicians are affiliated with the University of Colorado School of Medicine, part of the University of Colorado system. Based on the expansive Anschutz Medical Campus in Aurora, CO, the hospital is where patient care, research and education converge to establish the future of health care delivery.

