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*July 2007*

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**Is There a Viable Alternative to Fee for Service?**

**H**ealth policy experts, academics, and many physicians themselves believe fee for service payment is a leading cause of rising costs, inconsistent quality, duplicative service, lack of care coordination, and fraud.

Medicare and other patients bounce among doctors, most of whom are unaffiliated with one another and as a result, few patients have a single doctor central to the care they receive, says Peter Bach, MD, a physician at Memorial Sloan-Kettering who recently served as senior advisor to the federal Centers for Medicare & Medicaid Services (CMS). The problem is fee for service payment, Bach added. In fact, fee for service offers an incentive to physicians to provide more services and more expensive services, he said in a recent article in *The Wall Street Journal*.

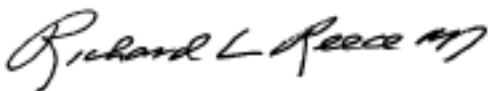
While fee for service may be flawed, it is not easy to identify a workable alternative. Some experts believe we could organize doctors into larger groups, pay them salaries, and reimburse these groups on a risk-adjusted basis for the full spectrum of care for each patient. Experts also say we should establish medical homes for patients by putting them under the guidance of one doctor or one group and reimburse for episodes of care rather than for individual services. At the same time, the system should be organized so that physician and hospital services are integrated for patients with chronic diseases, among other improvements.

Given the autonomous nature of physicians and the fact that 75% of doctors practice in groups of five or fewer, these changes are not likely to occur soon on a large scale.

Many different models of payment have been tried in limited situations. We have seen prepaid care, gatekeeper physicians, and large integrated systems. Each of these has had varying degrees of success and none has successfully controlled the rising cost of care over more than a few years. Just last month, Hewitt Health Resource, a consulting firm in Lincolnshire, Ill., said that initial 2008 HMO rate increases are averaging 14.1%, the highest rate increase in four years.

It is doubtful that fees for individual services can be seriously curtailed. These fees may be bundled, integrated into packages for a range of services for a given disease or procedure, and in certain regions of the country, prepaid care may prevail. But fee for service is likely to continue to be a significant part of health care payment. It is simply not possible to pay doctors in any other way.

Congress may reduce fees and it may compare resource use among doctors so that it can penalize those who overuse services, but it is unlikely to change the way most doctors are paid.



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# Sweet Release from Pain: Taste Research in Pediatric Pharmacotherapy

By Sharon L. Cross, PhD

**H**ave you ever put something sweet in your mouth and instantly felt better? Humans, and especially children, are wired to enjoy sweets. Sweet tastes cause a biochemical cascade that culminates in a feeling of pleasure and even analgesia. Over the past several years, researchers have been particularly interested in the effects of sweet taste in children, particularly for relieving pain and improving the palatability of medicines. The conclusion is that in certain situations sugar can be good for children—in limited quantities, of course.

## **A Natural Attraction**

The ability to taste develops prenatally, and structurally mature taste buds can be seen as early as the 13th to 15th week of gestation. At birth, neonates can detect and show a preference for sweet solutions.

“Taste has evolved to attract us to energy-rich foods that are good for us,” explains Julie A. Mennella, PhD, a biopsychologist at the Monell Chemical Senses Center in Philadelphia. “Children are born with a strong preference for sweet tastes. This preference serves to attract them to sources of high energy, such as mothers’ milk, and later, carbohydrates during periods of maximal growth.”

Sweet tastes generally correspond to carbohydrates and are associated with calorie-dense foods that

enhance survival. In contrast, bitter tastes can indicate the presence of a toxic substance. The instinct to reject bitter tastes evolved to protect against poisoning. Consequently, preferences for foods that taste bitter, such as coffee and dark green vegetables, are largely learned.

## **A Safe, Effective Analgesic**

Sweet solutions have been used to calm babies through the ages, but it wasn’t until the 1980s that results from animal studies suggested a scientific basis for their effect. Blass and colleagues found that an intraoral infusion of sucrose reduced pain and distress in rats, and that an opioid antagonist prevented this response (Blass et al., *Pharmacol Biochem Behav* 1987;26:483). Together, these findings suggested that sucrose triggered an opioid-like response that resulted in analgesia.

Shortly thereafter, researchers began to examine the effect of sucrose solutions in newborns. Pharmacologic agents are used to provide analgesia for neonates undergoing major procedures, such as surgeries, but usually not for less serious events, such as heel lances and immunizations. They are not used in part because of the lack of agents considered to be safe and effective, and also because of the belief that the pain felt during these events was not significant. In the past 20 years,

however, there has been a growing awareness that pain may have short-term and long-term consequences in neonatal development. Sucrose solutions thus provide an option for pain relief without the possible complications associated with pharmacologic agents.

Multiple studies have shown that the administration of oral sweet solutions to neonates reduces the pain felt during heel lances and immunizations. Pain is reduced by approximately 20%, and the effect peaks at about 2 minutes following sucrose administration and lasts for as long as 10 minutes.

## **Additive Effects**

Some studies have further suggested that sweet solutions, sucking, and cuddling have additive effects on pain relief. Although pain is difficult to assess in newborns, the consistency of the data is striking. In addition, oral sucrose eliminates the electroencephalography changes that occur in response to pain in neonates, providing an objective measure of the analgesic effects of sucrose.

The most effective dose of sucrose has not yet been determined, but babies appear to prefer very sweet tastes. In various studies, researchers have successfully used dosages between 0.012 and 0.12 g (0.05 to 0.5 mL of a 24% solution). To put this

*(Continued on page 4)*

**“Taste has evolved to attract us to energy-rich foods that are good for us. Children are born with a strong preference for sweet tastes; this serves to attract them to sources of high energy such as mothers’ milk,” comments biopsychologist Julie A. Mennella, PhD, of the Monell Chemical Senses Center.**

(Continued from page 3)

level of sweetness in perspective, a 24% solution has more than twice the concentration of sucrose encountered in most popular cola beverages.

### Mechanism of Effect

Although animal studies implicated the involvement of opioid receptors in sucrose-induced analgesia, the mechanisms behind this effect in babies are not fully understood. The release of endogenous opioids in response to sweet tastes seems the most likely mechanism, but one study found that administration of an opioid antagonist does not blunt the analgesic response in newborns (Gradin and Schollin, *Pediatrics* 2005;115:1004). Taste is clearly a critical component as intra-gastric administration of sucrose is not effective. Sweet substances other than sucrose, including nonnutritive sweet substances such as aspartame, also elicit an analgesic response. One study was unable to detect the expected increase in endogenous endorphin concentrations in response to oral sucrose. Further research is required to understand how sweet solutions mediate pain relief.

Most studies of the analgesic effects of sweet solutions have been conducted in infants, but a few have evaluated this effect in older children and adults. Intraoral sucrose increased the pain threshold in children 8 to 11 years old, but did not affect pain tolerance or intensity (Miller et al., *Pain* 1994;56:175). A study conducted by Pepino and Mennella in children 5 to 10 years old found that a sucrose solution increased pain threshold and tolerance in children who preferred

## Assessing Pain in Infants Can Be Challenging

All pain is subjective, but assessing pain is particularly difficult when the participants cannot say how much it hurts. On the other hand, babies don't typically try to hide their feelings or "act tough." So how do researchers evaluate pain in neonates?

Most of the studies on pain relief mediated by sweet solutions have evaluated cry behavior, usually the duration of crying after a painful procedure. Other parameters sometimes assessed include the quality of sucking and grimacing. Multidimensional measures use a combination of parameters, such as facial expression, limb movement, and vocal expression, to evaluate pain. Some also include physiologic measures, such as heart rate.

The American Academy of Pediatrics recommends that multidimensional tools be used to assess pain in neonates, and lists nine different ones, including NIPS (Neonatal Infant Pain Scale), SUN (Scale for Use in Newborns), and BPSN (Bernese Pain Scale for Neonates) that are suitable for this purpose (*Pediatrics* 2006;118:2231).

—SLC

higher levels of sweetness (greater than or equal to a 24% solution), but not in children who preferred lower levels of sweetness. This finding suggests that the pleasure (hedonic value) associated with a sweet substance influences the pain relief derived from it (Pepino and Mennella, *Pain* 2005;199:210).

### Sweet Solutions

There have been mixed findings with respect to sucrose-induced analgesia in adults. It is known that sweet-induced analgesic effects decline in animals during development, and this decline may occur in humans as well. In contrast to their findings in children, Pepino and Mennella did not observe an analgesic benefit in adult women given intraoral sucrose,

regardless of their preference for sweets. Nevertheless, Mennella observes, "Sucrose-induced analgesia is not as robust in adults, but I'm not convinced that it's absent." For instance, eating something sweet is known to allay the urge to drink for some adults undergoing rehabilitation for alcohol abuse, suggesting that sweet taste helps replace the opioid stimulation that alcoholic beverages provided previously.

Some studies have detected sweet-associated pain relief in adults. In general, pain threshold was improved, but pain tolerance was unaffected.

One study involving young adults (mean age of 24) found that a sweet solution resulted in an increase in pain tolerance, but that this effect was limited to subjects with lower

**"We are hopeful that the knowledge gleaned from this research will lead to better masking of bitter tastes and, in turn, more palatable oral medicines for children. This could mean life or death for children who resist taking medicines they need, such as antiretroviral drugs, because of their taste," says biopsychologist Julie A. Mennella, PhD, of the Monell Chemical Senses Center.**

blood pressure (Lewkowski et al., Pain 2003;106:181). The authors speculated that higher blood pressure may lead to opioid dysregulation, which interferes with the analgesic effects of sweets.

### **Taste Research**

In an American Academy of Pediatrics survey conducted in 2000, over 80% of pediatricians reported that they considered the unpleasant taste of medication to be an important barrier to compliance. Although sweeteners or foods such as applesauce may make the medicines easier to take, sweet substances are often ineffective in masking bitter tastes and may affect bioavailability. The palatability of medicine is a particular problem for children with chronic diseases, who often face a lifetime of multiple daily medications. It is estimated that as many as 70% of children with chronic diseases have poor treatment compliance.

Such problems have helped focus attention on research into taste. "The last decade has witnessed an explosion in molecular biology research into the genetics of smell and taste receptors," Mennella says. "We are hopeful that the knowledge gleaned from this research will lead to better masking of bitter tastes and, in turn, more palatable oral medicines for children. This could mean life or death for children who resist taking medicines they need, such as antiretroviral drugs, because of their taste."

### **Pediatric Initiative**

The importance of taste in children's medications has prompted the

## Taste-Receptor Cells Recognize Five Types

Researchers generally recognize five distinct tastes: sweet, bitter, sour, salty, and savory (also referred to as umami or the detection of glutamates such as the food additive MSG). The taste-receptor cells are responsible for processing taste. These cells are assembled into taste buds on the tongue and palate.

The process of taste is initiated by the binding of specific molecules in the food substance (tastants) to receptors on the surface of taste-receptor cells. Sweet and savory tastes are mediated by a small family of three receptors, while bitter taste involves about 30 receptors. Although the receptors for these tastes are expressed in different cells, the tastants use a common signaling pathway to result in cell activation. Sour and salty tastes appear to work somewhat differently. Sour taste involves a specific transient receptor potential (TRP) ion channel. Because sour taste is caused by acids, this system appears to have pH-sensing functions in other parts of the body as well, including the brain. The salt receptor may also be an ion channel, but its identity remains unclear.

—SLC

National Institute of Child Health and Human Development to form a working group on Taste, Smell, and Flavor Research in Infants and Children as part of its Pediatric Formulation Initiative. This working group is one of four established to improve pediatric therapies in accordance with the Best Pharmaceuticals for Children Act of 2002. In a meeting to establish priorities, the taste working group identified the following areas as most in need of attention:

- Research on bitter taste and taste masking in human and animal models, including methods for testing children
- Ways to measure medication compliance
- Determination of the molecular structure of the bitter taste receptors.

The challenge for researchers interested in medication compliance is to develop compounds that can mask bitter taste without affecting the stability or bioavailability of the drug. The resulting product must have a taste, texture, color, and odor that children find acceptable. Although various technologies are being explored, including an electronic tongue designed to sense flavors, there is currently no viable replacement for testing in children. One of the goals of the taste working group is to make palatability testing more uniform by establishing validated methods of taste evaluations suitable for different age groups.

—Reported and written by Sharon L. Cross, PhD, in Mission Viejo, Calif. More information on physician practice strategies is available on our Web site (see page 8).

**The importance of taste in children's medications has prompted the National Institute of Child Health and Human Development to form a working group on Taste, Smell, and Flavor Research in Infants and Children as part of its Pediatric Formulation Initiative.**

# Consider the Value of Decision Support

By Joseph Britto, MD

**A**dvances in science and technology have led to remarkable changes in health care and in the delivery of patient care. New diagnostic tests, medical devices, and treatments enable clinicians to treat patients more quickly and more effectively than they could in the past. Despite these extraordinary advancements, a fundamental problem continues to hinder the quality of patient care.

As an increasing amount of medical knowledge becomes available, physicians and other providers are expected to recall and synthesize a staggering amount of information surrounding clinical features, differential diagnoses, investigations, treatments, and complications for thousands of disease entities. For any given set of clinical features, it is difficult to construct, on every occasion, a complete and safe differential diagnosis, no matter how well trained, well read, or well practiced a physician may be. This failure can lead to delays in diagnosis and misdiagnosis.

## Identifying Errors

A poll the National Patient Safety Foundation commissioned found that one in six persons has personally experienced a medical diagnosis error. Furthermore, according to a 2005 meta analysis, funded by the federal Agency for Healthcare Research and Quality and published in *Advances in Patient Safety*, diagnosis errors represent 10% to 30% of all cases of medical error.

Unlike most medical errors, which

*Joseph Britto, MD, is the CEO and cofounder of Isabel Healthcare Inc. (at [www.isabelhealthcare.com](http://www.isabelhealthcare.com)), a company in Reston, Va., that provides physicians and other providers with decision support systems to reduce diagnosis errors.*

**Diagnosis reminder systems decrease diagnosis errors by providing physicians with a list of likely diagnoses for a given set of signs and symptoms and the most up-to-date and relevant clinical information about the potential diagnoses.**

are usually errors of commission, diagnosis errors are usually errors of omission and therefore are difficult to identify and measure. A 2005 study published in the *Archives of Internal Medicine* found that the cognitive error of premature closure is the single most common cause of diagnosis errors. Premature closure occurs when a clinician arrives at an initial diagnosis that seems to fit the facts but then does not consider other reasonable possibilities.

Diagnosis decision support systems (DDSS) offer physicians an easy to use, effective means of ensuring that all possible diagnoses are considered and diagnosis delays are reduced.

While the use of emerging DDSS is growing, some health care providers remain wary because early DDSS did not live up to their advance promise. If anything, they slowed the diagnosis decision-making process. Obviously, this drawback made DDSS unsuitable at the point of care and in the clinical workflow.

Traditional DDSS often operated on a rules-based design and did not use natural language processing. In studies, rules-based systems took 20 to 40 minutes to use, making them impractical at the point of care. Traditional DDSS were also designed as expert systems that had a didactic and prescriptive approach. These systems told physicians what to do rather than treating providers as learned intermediaries

and reminding them of diagnoses they might want to consider. Emerging DDSS treat health care professionals as the experts and are designed to provide decision support, leaving the final decision to the professional.

## Point of Care Information

Also consider that traditional DDSS do not easily allow physicians to use these systems during patient encounters. If providers cannot employ a DDSS during a patient encounter without adding time to the visit, then they are not likely to use these systems. Health care professionals at the point of care are not going to guess at the diagnosis and do the research later to check the diagnosis. Changing a diagnosis after the patient encounter would not engender the kind of patient confidence providers seek and enjoy.

Diagnosis reminder systems provide an effective option to prevent diagnosis errors by arming physicians with the most up-to-date and relevant clinical information. Diagnosis reminder systems decrease diagnosis errors by providing physicians with a list of likely diagnoses for a given set of signs and symptoms and the most up-to-date and relevant clinical information about the potential diagnoses.

Better quality care is also good for business, and there are several ways that using a diagnosis reminder system can improve a practice's

results. These systems help to reduce clinical risk and malpractice premiums while increasing patient satisfaction. Also, some DDSS allow physicians to get continuing medical education credit while seeing patients.

**Reducing clinical risk.** Being able to produce a comprehensive check of diagnoses within seconds will reduce the chance of missing something important, which will help reduce the potential for a malpractice claim. The fact that there would also be a record of the diagnosis considered to support a case would provide an important audit trail and a good first line of defense.

Contrary to what some critics say, having a DDSS does not increase a physician's liability if the system is used and the diagnosis is missed. Courts have treated clinical decision support systems as textbooks, assuming that clinicians consult such systems and in this way, they supplement the physician's knowledge but do not supplant the provider's judgment.

**Reduction in malpractice premiums.** Since misdiagnosis accounts for over 40% of malpractice claims, it is likely that a physician's malpractice insurer would consider a reduction in premiums for using a properly validated DDSS.

**Increased patient satisfaction.** When working in partnership with patients, physicians often find that patients respond well when physicians review a comprehensive list of possible diagnoses. Patients find such thoroughness is reassuring and shows that the physician is delivering the best care. A satisfied patient is the best way to attract new patients as these patients are likely to report such care to friends and family.

**CME.** With some DDSS, physicians can earn CME credits while seeing patients, thereby giving a direct link between quality of care, patient satisfaction, and increased efficiency.

When seeking a practical system that physicians can use at the point of care, practices should consider that

## AMIA Releases CDS Roadmap

Last year, the American Medical Informatics Association (AMIA) released a report explaining how health systems could adopt clinical decision support systems. The report, *A Roadmap for National Action on Clinical Decision Support*, outlines a variety of approaches for providing clinicians, staff, patients, or other individuals with timely, relevant information that can improve decision making and prevent errors.

The report also makes recommendations on ways to advance the development, adoption, and value of clinical decision support in improving health and the quality and safety of health care delivery.

The roadmap identifies three pillars that are needed to support widespread and optimal use of clinical decision support (CDS):

1. Make the best knowledge readily available when it is needed.

Actions include building highly practical formats and services for representing, collecting, organizing, and distributing clinical knowledge and CDS interventions.

2. Foster increased adoption and effective use. Actions include organizing and publishing strategies for improving CDS system design, usability, and implementation, as well as strategies for addressing legal and financial barriers.

3. Continuously improve CDS interventions and health-related knowledge. Actions include developing systematic methods for sharing CDS experience and for leveraging electronic health records to enhance clinical knowledge.

some of the best DDSS are Web-based, meaning physicians can get quality diagnosis decision making information at the point of care if using a desktop, laptop, personal digital assistant (PDA), or other Web-connected device. The best programs in this class will provide an instant checklist of diagnoses for clinicians to consider. In a split second and at the point of care, these systems address the questions clinicians frequently ask: What diagnoses should be considered?

Typically, these systems are formatted for use on a PDA with wireless Internet connectivity. Having such access allows physicians to get information at the bedside and at any point in the continuum of care, meaning they can get the information while seeing patients in the physician's office, in a hospital, or even at home after hours if needed.

For hospitals, such systems cost about 50 cents per bed per day. The annual cost for hospitals starts at \$180 per bed and goes down on a

sliding scale based on size. Individual physicians and group practices can purchase such systems for about \$60 per clinician, per month. Physicians should not pay any additional set up or upgrade fees.

Clearly, the development of such systems means physicians and other providers should re-examine any resistance they have had to diagnosis decision support systems. While earlier iterations may not have been validated and may have exhibited limited accuracy, the latest generations of this technology have undergone clinical trials and are proving to be highly effective and user friendly. The systems reduce the risk of misdiagnosis related to malpractice claims, thereby saving time, money, and lives. What's more, they are helping physicians to do what they were trained to do: deliver high quality patient care.

—More information on physician practice strategies is available on our Web site (see page 8).

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