CARIES:
A SENTINEL HEALTH EVENT

The following pages lay the foundation for reframing our approach to treating caries.

The words caries and tooth decay are used intentionally

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This document builds a case, step by step, to support the claim that caries is a sentinel health event. From the detailed description and examples of sentinels to historical contexts and current health trends, critical facts emerge, urging dentists to recognize their strategic position in health care and their vital role in driving change towards a healthier future for all.

What is a Sentinel?

Sentinel species and sentinel events.

Sentinel event reviews (SER)

Sentinel health events (SHE)

What is a Sentinel?

SENTINEL: a soldier stationed as a guard to challenge all comers and prevent a surprise attack.

SENTINEL SPECIES: These are often animals used to detect risks to humans by providing advanced warnings of danger. The classic example is the "canary in the coal mine." Until the end of the 1980s, miners brought canaries into coal mines as an early warning signal for carbon monoxide. The bird's unique respiratory system and high metabolism, compared to the miners, led birds in dangerous mines to succumb before the miners, thereby giving the miners time to act.

SENTINEL EVENTS IN HOSPITALS are unexpected events that result in a patient's death or a serious physical or psychological injury. In an article published May 3, 2016, in The British Medical Journal, Johns Hopkins patient safety experts have reported that more than 250,000 deaths per year are due to medical errors in the U.S.

A SENTINEL EVENT IN AVIATION is a significant negative incident that signals underlying weaknesses in the system. It is likely the result of compound errors and, if properly analyzed and addressed, may provide important keys to strengthening the system and preventing future adverse events or outcomes. Worldwide air traffic fatalities have averaged 422 per year over the last ten years.

Teeth are strategically positioned and uniquely designed to serve as early indicators of potential future adverse health events or outcomes.

Examples of sentinel events

Wrong site surgery

Delay in treatment

Mesothelioma

The Flint water scandal

Lion Air Flight 610 and Ethiopian Air Flight 302

Teeth are strategically positioned and uniquely designed to serve as early indicators of potential future adverse health events or outcomes.

What is a SER?

Sentinel event reviews (SER) were initially developed to understand the causes of industrial accidents better.

The SER process, a non-blaming and constructive approach, regularly brings all stakeholders together to discuss why a negative outcome or event occurred. This approach fosters a culture of learning and improvement, making it a valuable tool in various industries.

The overarching goal of an SER is to mobilize a routine, culture-changing practice that can increase system reliability and, hence, greater public confidence in a system's legitimacy.

A culture-changing practice in health care must welcome dentists as essential health care providers.

Sentinel Health Event (SHE)

A preventable disease

A Sentinel Health Event (SHE) is a preventable disease, disability, or untimely death whose occurrence serves as a warning signal that the quality of preventive and/or therapeutic medical care may need to be improved.

National Institutes of Health

How good is the quality of our preventive and therapeutic care for caries?

Caries:
from almost no one to almost everyone

From almost none to some

To almost everyone … and

An obesity crisis… and

The Commercial Determinants of Health

From almost none to some

Tooth decay emerged during the Neolithic Revolution, approximately 14,000 years ago. This period marks a time when bread-making became common practice, resulting in a carbohydrate-rich diet.

During this transition, Streptococcus Mutans, a key player in the development of tooth decay, made its appearance. Archeological evidence shows a significant increase in tooth decay after this transition, suggesting a direct link between the emergence of this bacteria and the dietary changes.

During the Industrial Revolution, 200 years ago, advancements in technology allowed for the mass production of goods, including flour and sugar. Our consumption of added sugar increased to 2 teaspoons per day.

Today, we unknowingly consume about 10 teaspoons of added sugar every 7 hours.

To almost everyone … and more

Research in the early 1900s revealed a startling reality: 84% to 99% of studied populations had evidence of multiple carious lesions in children and adults. To address this significant public health concern, experts from Michigan and Colorado who had observed the benefits of fluoride suggested Community Water Fluoridation (CWF) as a promising solution.

In 1951, CWF was implemented as a policy in the USA. The policy was a resounding success, significantly reducing the incidence of tooth decay. So successful, in fact, that in December 1983, the New York Times published an article titled "An End to Cavities," reporting public health experts' prediction that tooth decay among children and young adults would be eradicated by the turn of the century.

However, this optimistic prediction would never come to pass. The reason? In a move now recognized as a prime example of Commercial Determinants of Health, the Sugar Research Foundation, a trade group, paid Harvard University nutritionists to counter research linking sugar to coronary heart disease. Instead, they recommended reducing dietary fat and cholesterol, which would have far-reaching implications for public health.

As a result, the 1970s saw the emergence of low-fat diets, heavily promoted to prevent heart diseases and facilitate weight loss. However, reducing fat content significantly diminished the palatability of processed foods. Food manufacturers increasingly incorporated sugar to counteract this, enhancing the taste but contributing to higher sugar consumption.

Today, not only are we nowhere near eradicating tooth decay in children and young adults, but other problems have also grown exponentially. The weight problem of the 60's and 70's has morphed into an obesity crisis affecting more than 40% of American adults.

If we had recognized caries as a systemic health issue rather than a localized condition, our strategies to combat it would have been drastically different. This shift in perspective could have altered the course of the current health crisis, potentially lessening its severity.

Our siloed approach to health care serves no one well…

Commercial Determinants of Health

Over more than 40 years, five committees commissioned by the World Health Organization (WHO) made formal recommendations regarding sugar. All along, the food and beverage industry has influenced these committees, effectively delaying corrective action in terms of sugar intake. As a result, recommendations were not officially endorsed as WHO policy until 2014, when a fifth WHO expert committee recommended once more to limit free sugars to less than 10%, ideally 5%, of total energy intake (12 to 6 teaspoons). New dietary guidelines from the USDA and HHS released December 29, 2020, omitted recommended cuts to sugar intake…

The American Heart Association, having adopted the WHO's additional recommendation to limit free sugars to below 5% of total energy intake, called out a missed opportunity for the USDA, and HHS…

Sentinel Health Event:

A preventable disease that serves as a warning that the quality of our care may need to be improved.

CARIES is a SHE

Preventable Exposure: It's crucial to highlight that exposure to excessive amounts of sugar is avoidable, emphasizing the role of appropriate public health and medical interventions in maintaining public health.

Public Health Indicator: The current incidence of caries, despite the broad use of fluoride in water, toothpaste, and mouthwash, coupled with our current obesity crisis and high incidence of non-communicable diseases, indicates broader systemic failures in regulatory oversight and public health protection.

Awareness and Action: For over forty years, the food and beverage industry interfered with the WHO's recommendations for reduced sugar intake.

Vulnerable Populations: The excessive consumption of sugar via processed and ultra-processed foods disproportionately affects vulnerable populations, including children, who are particularly susceptible to the harmful effects of sugar.

Broader Implications: The high incidence of non-communicable diseases, including caries, highlights social injustice, commercial determinants of health, and the importance of community engagement in public health decisions.

Caries… a preventable disease

whose occurrence serves as a warning signal that the quality of our preventive and/or therapeutic care may need to be improved.

How good is the quality of our preventive and therapeutic care for caries?

Teeth can save lives

Their strategic position

Incapable of cellular turnover

Enamel: hardest tissue in the body

Enamel breakdown = WARNING

Strategic position

Teeth are the sentinels of our bodies

TEETH are stationed at the entrance of the digestive system, like sentinels⋯ at the confluence of nutrition and health. They are the first to be exposed to all the foods and beverages we consume, and they are easily accessible for examination.

Teeth are first in a long list of other organs to suffer from the unhealthy imbalance of our modern diet.

Acellular enamel

TOOTH ENAMEL is acellular. It can not regenerate itself like other biomineralized tissues such as bone.

Unlike other tissues in the body, tooth enamel, once fully formed, is incapable of cellular turnover. Therefore it is more susceptible to adverse conditions, like the canaries in yesteryears' mines. Their sensitivity made them useful early indicators of dangers not immediately obvious to humans.

Teeth: like the canaries in yesteryears' mines, early indicators of dangers not immediately obvious.

Enamel: hardest tissue

Is it a local event when enamel collapses due to modern diet imbalances?

When enamel collapses due to dietary imbalances, it is not merely a local event affecting just teeth. This collapse is an early indicator of broader systemic stresses, which, if unaddressed, will manifest into chronic diseases later in life. The conditions impacting enamel must be tackled systemically to prevent this cascade of health issues...

Now consider this paradox: tooth enamel is the hardest tissue in the whole body, more than 2 1/2 times harder than bone. Why are we treating its collapse with a patch?

Caries is a systemic disease.

CARIES is a WARNING

CARIES, as a Sentinel Health Event, is a disease that can be prevented. Its occurrence acts as a crucial indicator that the quality of preventive and/or therapeutic medical care may require enhancement or alteration.

Fluoride is amazing as a remineralization therapy. Had the sugar content of our diets not changed so dramatically over the past few decades, it is quite possible that the public health experts' predictions of 1983 would have materialized: tooth decay in children and young adults would have disappeared 20 years ago⋯ and our work as dentists would be very different.

Today, dentists operate amidst a health crisis that begs us to reframe our approach to treating caries and to reinvent ourselves. What if dentists focused on metabolic health from the moment we see signs of caries in a patient's mouth, especially children? When the hardest tissue in the whole body breaks down as a result of an imbalance in the environment in which this tissue exists, shouldn't we be alarmed and driven FIRST to investigate how other organs and tissues are also stressed by this imbalance?

Shouldn't we take affirmative action to prevent permanent damage to other, more remote tissues? Before we mention drilling and filling? With their capacity for cellular turnover, the heart, pancreas, and liver, especially in youths, can cope longer than teeth with the stress of a diet-related imbalance, but not forever. Is it a coincidence that in vulnerable populations, there is a striking parallel between childhood caries and the rates of obesity and type 2 diabetes?

Caries is but a local expression of a far more serious metabolic health crisis.

Deconstructing the silos

Checklists

Pit crew approach

Mission Control

Becoming PARTNERS in HEALTH

Borrowing checklists from the aviation world

Created in the aviation world in the 1930's, checklists are deceptively simple. Many types of checklists already exist in dentistry ensuring that no essential step gets forgotten in opening or closing the clinic, or sterilizing instruments, for example.

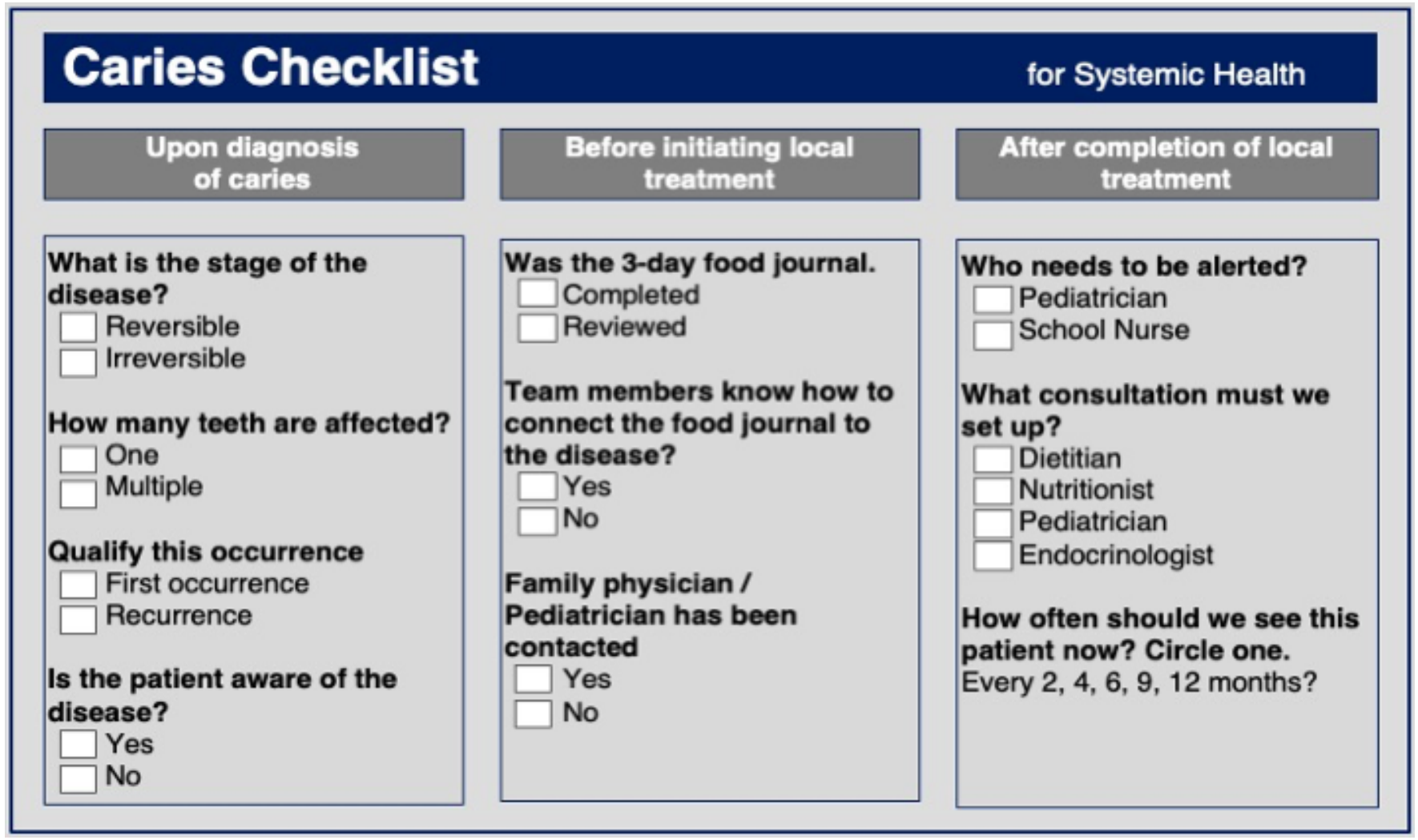
Yet, checklists related to the diagnosis of caries are terribly incomplete, if not missing altogether. Such checklists, inserted at critical pause points of a patient's visit, can be key to connecting our patients to other health leaders and correcting past medical errors, such as the separation of dentistry from medicine.

The concept of 'critical pause points' is pivotal in the use of checklists. These are the moments in a patient's visit where a checklist can be most effective in ensuring comprehensive care and preventing any crucial steps from being missed.

The first critical pause point in any dental office is when we diagnose caries. Another critical pause point should be when a patient is about to leave our office after local treatment for caries.

There may very well be other critical pause points. It is up to us to identify them and to create corresponding checklists to reconnect teeth to health purposefully.

Checklists related to the diagnosis and treatment of caries must serve the purpose of connecting teeth to health.



Checklists related to the diagnosis and treatment of caries must serve the purpose of connecting teeth to health.

Borrowing pit crews from the F1 racing world

There's an adage in auto racing that races are won in the pits. But it hasn't always been that way: the super-fast pit stops of today are the result of a long road of innovation applied after careful observation of pit crews in action. In the 1950s, when Community Water Fluoridation was being launched across the USA, the average time for a pit stop during an F1 race was more than 60 seconds. Today, a pit stop is somewhere around 2 seconds. What a change! Technology has had a lot to do with this achievement, just like technology has played a major role in the restorative prowess we can achieve today in dentistry. We should be proud of this as we will continue celebrating these successes with our patients for decades. But there is something we can learn from Formula 1 pit crews.

Like everyone in healthcare, each member of the F1 pit crew holds an important piece of the racing puzzle, but the winning secret lies in how they come together as a team, how they train, focus, and communicate with one another. It's not the pilot alone who wins the race, just like physicians alone can not heal patients.

Communication in F1 racing is a fine-tuned machine by itself and one that our healthcare system could emulate. In F1 racing, there is an entity called Mission Control, a bank of computers feeding engineers data on everything pertinent to the race. The strategic data bits are relayed to the race engineer, who communicates with the pilot and the pit crew.

Let's ensure that health data from the mouth becomes part of our healthcare data system, that dentists share their important health information, and that they communicate with their medical colleagues.

In the race to heal medicine before we run out of money to fund health care, we, dentists, must find our way into becoming full-fledged members of the health care pit crew.

Mission control

The body is an ecosystem. Dentists are physicians of the mouth. But when we are fixing teeth without connecting the dots of history, histology, and dirty secrets, failing to inform the pit crew, the physicians, the pediatricians, and the endocrinologists, we are jeopardizing our patients… We are allowing them to become obese, diabetic, or hypertensive when we could have potentially prevented these health catastrophes that lead to premature death, which brings us back to the statistics shared at the beginning regarding deaths related to medical error. I don't believe the systemic impact of treating tooth decay as a local health event was ever considered.

In health, there are different types of pit stops: the dentist, the cardiologist, and the endocrinologist, to name a few, but there doesn't seem to be much of a mission control. In addition, communication between crew members leaves a lot to be desired. Health care is a team sport, and dentists, working at the confluence of nutrition and medicine, hold a strategic position in health care.

Communicating with other healthcare professionals about the status of the enamel in the mouths of the patients with whom we share care may be critical information capable of transforming healthcare.

What if, like with F1 Pit Crews, thanks to Mission Control, when a 5-year-old is diagnosed with caries, all crew members know precisely what to do to ensure a winning health trajectory for that patient?

To escape the long wilderness of not being part of health care, dentists must reconnect the teeth to the body in the capacity of sentinels, reframing human ecology. Teeth are not disposable body parts that we can drill, fill… and eventually replace with implants.

DENTAL HEALTH REPORT

Patient Name:

DOB: MM/DD/YYYY

Dental Visit Date: MM/DD/YYYY

Caries Assessment

- [ ] No Caries Detected
- [ ] Caries Detected
  - [ ] Single Tooth
  - [ ] Multiple Teeth

Occurrence:

- [ ] First Occurrence
- [ ] Recurrence

Stage of Disease:

- [ ] Reversible (Early Stage)
- [ ] Irreversible (Advanced Stage)

Periodontal Assessment

- [ ] No Periodontal Problems Detected
- [ ] Periodontal Problems Detected
  - [ ] Localized
  - [ ] Generalized

Depth:

- [ ] Limited to soft tissues (gingivitis)
- [ ] Extends to bone (Periodontitis)

Stage of Disease:

- [ ] Early
- [ ] Advanced

Summary of Concerns

- [ ] No Concerns

Based on problems detected, this patient is at increased risk of developing or worsening:

- [ ] Diabetes
- [ ] Cardiovascular Disease
- [ ] Fatty Liver Disease
- [ ] Metabolic Syndrome
- [ ] Other

Recommendations

Please consider evaluating this patient further for the risk factors associated with the conditions indicated above.

- [ ] Consultation with a Nutritionist

Dentist Name:

Dental Clinic:

Contact info:

TEETH are of GREAT CONSEQUENCE to HEALTH

Partners in health Teeth First

We must reframe the fundamental principles of health care.

Our task, as dentists, is to connect with other health stakeholders and inform them about the important role teeth play in the ecosystem we all inhabit: the human body.

Integrating dental health into the broader healthcare system is not just a necessity but a potential game-changer. It will address the root causes of caries and significantly improve overall health outcomes. This systemic change requires a coordinated effort across policy, education, healthcare delivery, and public engagement.

Recognizing caries as a SHE offers a powerful approach to transforming public health practices. It can catalyze systemic changes, fostering a culture of prevention and integrated care that benefits overall health.

Together, we can create a more holistic and effective healthcare system that better addresses the needs of all individuals.

Our destination is a cavity-free future for the benefit of everyone's health.

THANK YOU!

For more information visit
www.TeethFirst.org

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