RIPEGLOBAL

Safe Patients Through Skilled Dentists

Human Factor Driven Education for Dentists

"If pilots were taught the same way that dentists were taught a lot of them would die."

~ Dr Lincoln Harris

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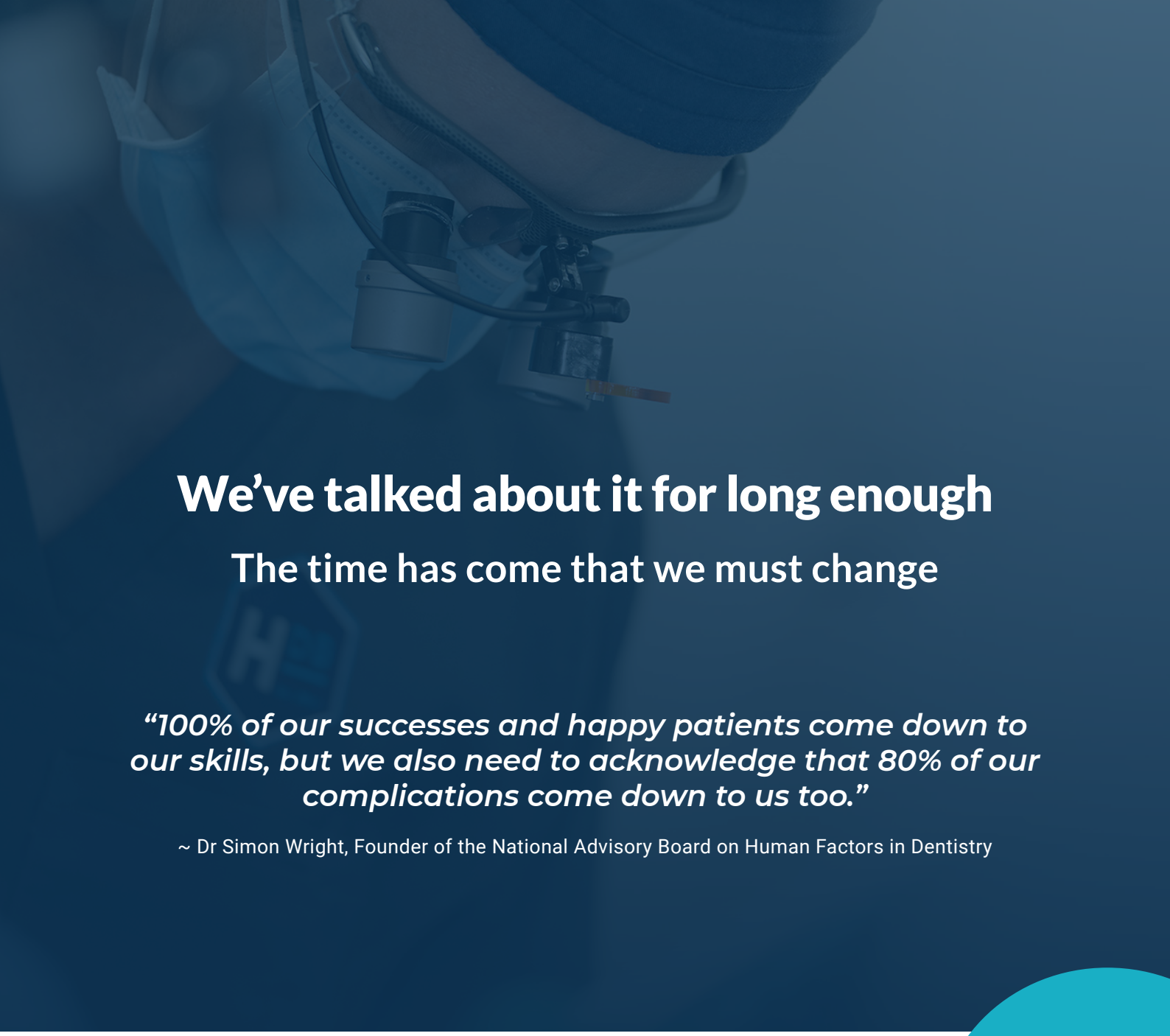


We've talked about it for long enough

The time has come that we must change

"100% of our successes and happy patients come down to our skills, but we also need to acknowledge that 80% of our complications come down to us too."

~ Dr Simon Wright, Founder of the National Advisory Board on Human Factors in Dentistry

Time for change

Emergency medical professionals undergo intensive training to withstand the potentially disastrous effects of human factors, however, with the exception of emergency medical responders, healthcare professionals do not.

Professions where highly educated experts perform complex skills with absolute precision under intense pressure, and which have catastrophic consequences should the professional's ability to perform their tasks be compromised, incorporate human factor education (HFE) into their undergraduate curriculum. Drills and training under simulated intense pressure is key when training professionals for readiness to embark on their career, and they will be required to re-take this training regularly.

In dentistry, there is no such training.

Granted, Human Factor Education is relatively new to the healthcare industry, and it's benefits - though glaringly obvious when one observes a paramedic at work, or listen to recordings of airline pilots who communicate calmly with their team while managing an emergency - the benefits are still debated.

A 2018 article titled, "Errors and Adverse Events in Dentistry – a Review describes the need for education in human factors to become a priority, while acknowledging that there were many impediments to such progress, as system changes are slow and difficult to implement. The authors lamented that, effectively, "it is up to individual practitioners to introduce the concept of human factors into their practice".

When exposed to a barrage of stress, pressure, limited tools, time constraints, accidental error, fatigue, distraction, and lack of information recall, the dentist who might have performed well in the classroom will likely not achieve a successful outcome in the clinic, nor can ensure their patient remains safe.

Industries that demand precise performance from their professionals under extreme stress should require human factor (or ergonomic) training that is central and reoccurring within their curriculum.

Though the exposure to extreme stress, fatigue, and the demand for calm teamwork in unexpected and urgent conditions is as high in dentistry as in professions where human factor education is thoroughly incorporated, there is exactly zero amount of hours focused on human factor education in undergraduate or postgraduate dentistry education.

Until Now.

RipeGlobal teaches elite skills practiced with repetition under simulated pressure.

- RipeGlobal is the first dental education platform to incorporate pressure simulation into dental education and hyper-realise the relevant human factors (cognitive, physical, and social characteristics) of dentistry.

- We build skills-focused curriculum that incorporates a simulated clinical environment long before it's associated didactic counterpart. Our curriculum vision is to make it easy to do the right thing, and difficult - or even impossible - to do the wrong thing.

- Graduates will be able to confidently and accurately respond, learn, and adapt to fast-changing and intensely stressful events in their clinic.

Human Factors in Other Industries

NASA

A NASA paper on Human Factors distinguishes the automated performance of highly practiced tasks from the effortful performance of less familiar tasks which draws heavily on one's attention and working memory. The authors understood that when a threat produces anxiety in a pilot, their performance is likely to be undermined in specific ways.

Attention and **working memory** are essential for tasks involving novelty, complexity, and danger. Performing tasks requiring these two limited cognitive resources is typically slow and arduous. If all tasks depended primarily on these limited resources we would not function easily in the world.

Fortunately, with **highly practiced tasks**, a pilot's dependence on these two limited resources diminishes considerably, performance becomes largely automatic, which enables them to perform practiced tasks with minimum attention.

NASA observed that emergencies almost always require the interweaving of highly practiced tasks with less familiar tasks, novel situational aspects, and uncertainty. When there is an emergency situation, the overall demands on attention and working memory peak at a time when these limited cognitive resources may be disrupted by anxiety. Tasks such as decision-making, team performance, and communication which depends heavily on attention and working memory are likely to be impaired.

The authors of this paper expressed concern for the implicit assumption engineers have made, that experienced pilots in emergency situations would be able to perform normally: that is to say, pilots are assumed to process information, communicate, analyse fast-changing situations, and make decisions to the same capacity as if they were safely on the ground.

This assumption is not correct. NASA human factor experts determined that a pilots' vulnerability to error in stressful situations is reduced when they can perform the following skills under simulated extreme stress.

NASA pilots are trained to:

1. Recognise, interpret, assess and comprehend the full implications of a challenging situation that may change dynamically.
2. Keep track of where they are in a procedure or checklist.
3. Shift attention among competing tasks without becoming locked into just one task.
4. Identify and analyse decision options.
5. Step back mentally from the moment-to-moment demands of the flight situation to establish a high-level (meta-cognitive) mental model that guides action.
6. Continuously update that mental model as the situation unfolds.
7. Maintain the cognitive flexibility to abandon a previously selected procedure or course of action that has become inappropriate for the situation.

How

NASA suggests that these objectives can be supported by

- Revising existing flightdeck operating procedures regularly.
- Making checklists a part of their regular procedure.
- Training to reflect diminished attention control and working memory function in threatening situations.
- Stress exposure training to help pilots be less disconcerted when they experience the physiological effects and be on guard for the cognitive effects.

Aviation

Gordon DuPont, the first president of the Pacific Aircraft Maintenance Engineers Association, devised a framework that identified the 12 most common causes of errors in judgement that maintenance personnel make, which ultimately resulted in a maintenance error. He called them:

The Dirty Dozen Errors in Maintenance

1. Lack of Communication
2. Complacency
3. Lack of Knowledge
4. Distraction
5. Lack of Teamwork
6. Fatigue
7. Lack of Resources
8. Pressure
9. Lack of Assertiveness
10. Stress
11. Lack of Awareness
12. Norms **

**Norms are unwritten rules followed or tolerated by most of the group, but negative norms can detract from an established safety standard.

USAF Trauma Lanes Training

The military was the first industry to incorporate repetitive skills and teamwork practice under simulated stress into their education curriculum.

The proverbial drill sergeant in military training produces endless stress for the student, such as constant yelling, forcing trainees to complete physically demanding obstacle courses, and pushing the recruits to the point of exhaustion - while simultaneously demanding even greater performance from them until they learn to rise from their agony and overcome these challenges.

In particular, the United States Air Force (USAF) Pararescue Combat Rescue Officer Paramedic Program at Kirtland Air Force Base, in Albuquerque, New Mexico incorporates stress as an important part of their paramedic training. The school takes Pararescue trainees with no medical training and certifies them as Nationally Registered Paramedics in an accelerated 7-month format in a program called Trauma Lanes.

Paramedic students endure a grueling training of eight simulations per day for 5.5 days. These simulations are designed to challenge the student's medical knowledge, psychomotor skills performance, and their ability to both lead a medical team and follow the orders of a team leader.

They are constantly challenged and stressed by an instructor using a variety of techniques designed to fluster, distract, irritate, and rattle the students. This program creates significant positive results in the weeklong time period as the student's progress from performing very poorly under stress to excelling at a high performance level by the end of the 5.5 days.

Trauma Lanes program teaches future paramedics how to overcome the physiological and psychological consequences of stress and successfully perform under pressure in a simulated environment.

Stress: A Brief Overview

An estimated 60-80% of accidents at sea are ascribed to human error. More than 70 percent of commercial airplane hull-loss accidents are caused by human error. Medical error is the third leading cause of death in the United States, and approximately 200,000 people die every year as a result.

Two Types of Stressors are Identified in Human Factor Education

Physical or environmental stressors

This includes **sleep deprivation, fatigue, noise, temperature, crowding, isolation, or any stressors** that can have an effect on all subjects in a physical space. They are assumed to have primary and direct physiological effects.

Psychological stressors

Are broken down into three categories:

1. Those that signal danger or threat of physical or psychological harm.
2. Those that represent limitations of cognitive or physical capacity to meet a demand, such as high information load, workload, lack of control over a situation, ambiguity, and time pressure.
3. Those that include social factors, which reflect interactions with another person, either in a personal sphere such as with family or friends, or in a job context, such as with platoon or squadron members or with leaders.

Stress and the Paramedic Profession

The paramedic has the enormous responsibility of making life and death decisions, independently, and in a time-critical environment.

- They must successfully lead a team of medical and rescue providers, under pressure, to do what is best for the patient.
- They must perform complex psychomotor life-saving medical interventions immediately and correctly without error.
- They are expected to have the patient assessed from head to toe and all immediate life threats identified within 90 seconds.
- They are then expected to have those life threatening conditions managed, the patient packaged for transport and en route to the hospital within 10 minutes.
- Failure to accomplish all of these tasks can result in serious permanent injury or death to the patient.

Stress and the Dental Profession

A Dentist experiences unexpected events which requires complex psychomotor time-critical responses on patients who often experience intense pain and sometimes, permanent damage to their teeth, gum or bone, or who are under anaesthetic. The top five stressors dentists face are time pressure, patient demands, uncooperative patients, the need for high and enduring levels of concentration and focus, and team issues.

- The most important stress mitigator that dentists need to master is to accurately measure how long a task takes and set realistic time frames - not based on best-case scenarios. This controls the clinic environment.

- They must mitigate patient demands by mastering precise communication that focuses on robust informed consent and realistic expectations. This controls the dentist's anxiety.

- Dentists are expected to frequently use profound anaesthesia and anxiolytics in order to create predictable patient experiences. This controls the patient's anxiety.

- They are expected to break long intense procedures into distinct phases and factor into their plan periods of rest in order to maintain intense concentration and focus.

- They must know how to create the right environment and team. Though this is the fifth most significant stressor for a dentist, the effectiveness of the dentist's team directly impacts the above stressors. This controls the clinic's culture.

If you put a dentist in a well trained team and organised environment, it will minimise their stress levels and create frictionless clinical outcomes.

Three Teaching Methods Educators use to Help Individuals Reduce and Overcome Stress

1. Stress Inoculation Training (SIT)

SIT consists of an educational, rehearsal and application stage.

Educational stage: students are taught about different ways that individuals respond to different types of stress.

Rehearsal stage: students learn one of a number of stress management techniques that will work best for their specific situation.

Application stage: students apply the techniques they have learned, first in a simulated environment and then in the actual stressful environment.

2. Skill training

Skill training is aimed at relaxing or reducing the individual stress response by increasing the durability or automaticity of the skill itself.

For effective performance, the skill must be performed under operational conditions similar to those found in the work environment. Skills training mitigates the effects of stress by producing an *overlearned* behavior. This has the benefit of making well-rehearsed skills automatic and thus requiring less attention by the individual. This overlearned behavior is commonly referred to as "muscle memory."

Skills become less prone to degradation under stressful conditions.

This increases confidence and the individual's sense of control, which in turn reduces effects of stress on the individual.

One limitation to skills training is that exposure of stress to the professional degrades the performance even after high levels of skills training. In one major study, 100% and 150% overtraining by space flight professionals performed at only 50% after 19 days. This supports RipeGlobal's view that skills need to be repeated under simulated stress environments regularly.

3. Crew Resource Management Training (CRM)

CRM training applies to any action that requires coordinated action by teams of highly trained professionals who must function under dynamic high workload conditions.

CRM training is based on social psychology. Team building is the cornerstone of crew coordination and an emphasis is placed on building a sense of mutual trust, respect and responsibility for the crew's performance. Communication is a central tenet of CRM, and sharing information about problems that develop, intentions to address those problems, and who will perform various roles and tasks is essential.

CRM training is credited with saving many lives when a DC-10 lost all flight controls at 33,000 feet. The flight crew practiced CRM training and were able to work together to bring in the airplane for a controlled crash landing.

Incorporating Human Factor Education

The Goal

RipeGlobal incorporates Human Factor Education in courses to produce confident and competent dentists that keep their patients safe.

The Challenge RipeGlobal Courses Solve

Dentists will feel confident in performing a seemingly overwhelming amount of work under intense pressure, fast enough, safe enough, and with good patient outcomes. RipeGlobal courses are:

- Hands-on, skills-focused courses.
- They are often long.
- They are intense.
- They are iterative for the purpose of building muscle memory.
- There is a lot of emphasis on time pressure.

Our Method

- Teach practical exercises before theory.
- Skill before application of skill.
- Case presentations: learners present their own cases.
- Develop and maintain a standard of skills.
- Critical thinking: learners can read science papers, understand their limitations, and identify that the abstract and conclusion is often not representative of the results of the study.
- Theory follows practical exercises.
- Skill takes repetition. No task will be repeated just once.
- Comprehensive documentation: documentation creates a habit to attend to detail, and avoids mental scotomas of the dentist which could lead to critical error.
- Practice critical thinking for the purpose of avoiding critical error.
- Learn by teaching your peers.

Application of Human Factors Education

1. Stress Simulation Training

Educational

Educators describe the various ways in which dentists respond to different types of stress, physically and psychologically. Educators describe the limitations of cognitive and physical capacities to meet the demand of skills dentists need to cope with information or work overload, lack of control in their environment, never events, and time pressure.

Rehearsal

Learners are taught a number of stress management techniques that mitigate the common stressors dentists face in their practice.

Application

Learners practice these techniques against simulated stressors.

2. Skills Training: Fail First

The *fail first* method is proven to elevate the learner's ability to cognize new skills that are taught by educators.

Learners are asked to perform the skill prior to the skills training module. It is expected that they will fail, or experience high stress if they are successful.

The skills training module is taught.

Skills are practiced multiple times against elevating stressors.

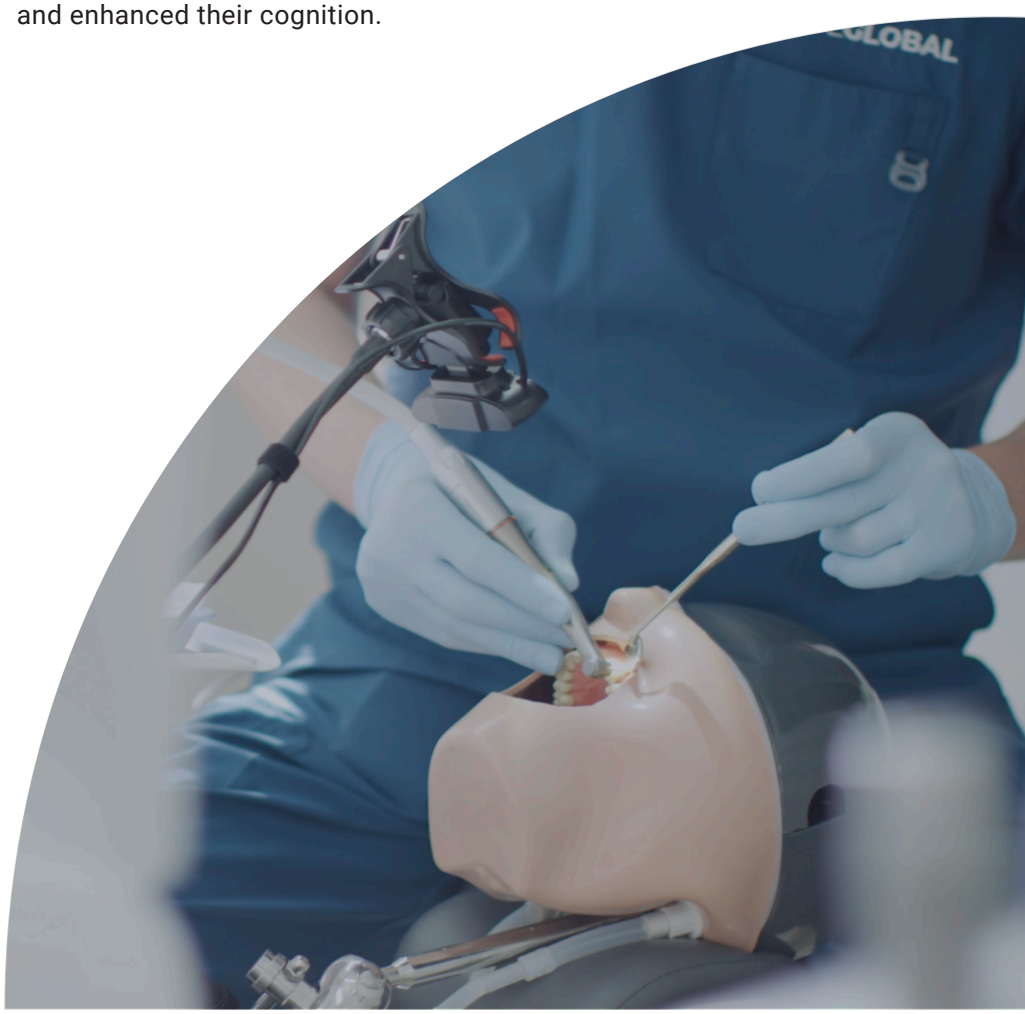
The learner will understand newly learned skills on a deep level because their memory of failing has underwritten the experience and enhanced their cognition.

3. Team Resource Management (TRM)

Team building is the cornerstone of team coordination, and communication is key to a successful and safe patient outcome, which is built on a sense of trust between team members.

TRM training is a series of drills that simulate common problems that develop in the clinic. Learners practice a coordinated response to these problems until they are part of their muscle memory.

TRM is an elective module.



A Comparison of the RipeGlobal teaching method with the General Format of Dentistry Education

Didactics of traditional dentistry ignores human factors, focuses on theory, and does not teach to a skill level.

A standard Dentistry Course entails:

- 1.5 hours theory
- Teacher demonstrates
- Learner practices once with assistance.

In standard dental education there is an overemphasis on knowledge, because:

1. It's cheap to teach.
2. There is a trend towards evidence-based education.
3. With a focus on knowledge there is a diminishing of skill.

Dentistry Courses Lack:

- Practicing learned skills repetitively and in a simulated stressful environment.
- Education on the human factors and ergonomics of the Dental profession.
- Assessment under simulated stressors.
- Context of curriculum theory.
- Vested interest by educational institutions in the outcome of the patients their dentists treat.

The dental profession requires a lot of knowledge, skill, and communication.

A product of practicing dentistry is an abundance of Stress.

The knowledge of theory enables the dentist to manipulate skills to suit their unique environment. However, without practicing these skills repetitively under varied and unpredictable pressure, theory alone will not produce dentists who are capable of responding flawlessly to emergencies that occur in their clinic.

ABOUT RIPEGLOBAL

We are a modern dental education platform. Made by practicing dentists, for dentists.

Our sole purpose is to democratise education, making it affordable and accessible to all dentists globally.

We have a revolutionary approach to education, featuring curated quality online content and uniquely taught courses that feature world class dentistry educators.

RipeGlobal helps to guide dentists, at any stage of their career, to become confident and competent in the pursuit of great dentistry and patient safety.

Discover more at www.ripeglobal.com

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