

## Review Article

# Autism Spectrum Disorders and the Role of General Dental Practitioners: A Review

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## Abstract

Autism Spectrum Disorders (ASD) is reported to affect 1% of the world's population, with a reported increase in prevalence of 556% between 1991 and 1997. Current behavioural and medical management techniques offer both medical and dental practitioners useful options in management of patients. This study aims to review behavioural management techniques that could assist or enhance management and treatment of ASD individuals in the dental office.

A Medline and PubMed search from 1950 to 2014 was performed using Key words "ASD", "behaviour specified", "Rett's syndrome", "Autistic disorder", "Asperger's disorder", "Childhood disintegrative disorder". The search returned 600 articles, however only 56 articles specifically related to recent advances in dental and medical treatment of ASD were included.

ASD presents challenges for patient, caregiver/parent and dental team. Major concerns in providing dental care include behavioural management and side effects of medications. The most accepted management techniques for ASD patients appear to be conscious sedation, familiarisation and visual schedules. Pharmacological management techniques, like conscious sedation are becoming more accepted should be used with caution. Less frequently accepted management techniques include hand over mouth and restraint.

To provide satisfactory dental care to ASD patients, dental practitioners should familiarise themselves with the current management techniques and techniques that are acceptable to parents and guardians.

**Keywords:** Autism; Autism Spectrum Disorder; Dentistry; Behavioural management; Dental fear

## Abbreviations

ASD: Autism Spectrum Disorders; DTP: Deep Touch Pressure; NO: Nitrous Oxide; GA: General Anaesthesia; DSM: Diagnostic Statistical Manual of Mental Disorders; PDD: Pervasive Developmental Disorders; SPD: Sensory Processing Disorders; ADHD: Attention Deficit Hyperactivity Disorder; HOM: Hand Over Mouth; AAPD: American Academy of Paediatric Dentistry; SCDA: Special Care Dentistry Association

## Introduction

Autism spectrum disorders (ASD) is a challenging neurodevelopmental disorders that affects 1% of the world's population [1,2]. It is important for dental practitioners to understand the aetiology, mental, social and oral health challenges that individual's with an ASD face. Publication of the 5<sup>th</sup> Edition of the Diagnostic Statistical Manual of Mental Disorders (DSM)[1] has resulted in changes to the diagnosis of ASD, and the criterion for identifying social problems in such individuals [3,4].

Before 2013, ASD were known as Pervasive Developmental Disorders (PDD). This group of conditions included Autistic disorder, Asperger's disorder, pervasive developmental disorders not otherwise specified (PDD-NOS), Rett's Syndrome, and childhood disintegrative disorder [5]. All such conditions involve issues with communication,

social interactions, and repetitive behaviours. Prior to 2013 a diagnosis of autism required identifying six, rather than three, symptoms in any/each of the following categories; communication problems, social skill problems and repetitive behaviours.

The multifaceted symptoms seen with ASD can present a challenge for dental practitioners, thus the dental team should be flexible in their management of individuals with ASD. It should be recognised that individuals with ASD, can feel a great deal of anxiety when they attend dental appointments; the fear of the unknown, trouble with direct communication, hand gestures, and sensitivity to loud noises can lead to noncompliance and uncooperative behaviour [7]. Dental practitioners may therefore find in office management and treatment of ASD individuals more challenging. This study reviews behavioural management techniques that could assist or enhance management and treatment of ASD individuals in the dental office [7].

## Methodology

In order to understand the complex nature of the effects of ASD on patients' social and mental capabilities and to then define the best types of behavioural and treatment management for ASD patients a Narrative Review was conducted. A Medline and PubMed database search from 1950 to 2014 using terms "ASD", "behaviour management", "treatment", "autism", "oral health", "parental acceptance", "practitioner acceptance", "pervasive developmental

**Table 1:** Severities of Autism Spectrum Disorder as per the DSM-V [6].

| Severity Level                              | Common social communication deficits  | Common restrictive and/or repetitive behaviours  |
|---|---|--|
| <b>1) Requiring support</b>                 | -Without support deficits in verbal and nonverbal communication causes noticeable impairments<br>-Difficulty initiating social interactions with examples of abnormal social communication<br>-May appear to be uninterested in social communication  | -Inflexible behaviours cause interference with daily life<br>-Some difficulty with coping and switching activities   |
| <b>2) Requires substantial support</b>      | -Marked impairment in verbal and nonverbal communication but can learn to cope and function with support<br>-Limited ability to socially interact even with support<br>-Abnormal response to social interactions, limited initiation of conversation  | -Inflexible with behaviour<br>-Difficulty with coping<br>-Distressed by change, difficulty changing focus<br>-Has repetitive/restricted behaviours frequently enough to be obvious to casual observers |
| <b>3) Requires very substantial support</b> | -Severe impairment in verbal and nonverbal communication causes severe impairment in daily function<br>-Very limited ability to socially interact even with support<br>-Cannot maintain relationships easily, rarely initiates conversation<br>-Cannot understand ambiguous language or communication | -Very inflexible with behaviour<br>-Extreme difficulty with coping<br>-Easily distressed by change<br>-Very repetitive with behaviours   |

disorders not otherwise specified”, “Rett’s syndrome”, “Autism Spectrum Disorder”, “Autistic Disorder”, “Childhood Disintegrative Disorder” was conducted. The search returned 600 articles, however only 53 articles specifically related to recent advances in dental and medical treatment of ASD were included. Articles were excluded if they were not written in English, did not have a reproducible methodology, were not associated with ASD patients, or did not have any relationship to dental treatment or behavioural management of ASD patient in a dental environment. All articles were compared and contrasted for current methods of diagnosis of ASD, effects of ASD on oral health and the most consistently accepted, and non-accepted methods of behavioural management, this study also examined the acceptance of amongst practitioners and parents/carers.

## Diagnosis and Definition

Diagnosis of ASD is currently based on two areas: (A) persistent difficulties in social communication and social interaction across multiple areas of daily living, (B) restricted and repetitive behaviours and interests [6]. For definitive diagnosis of ASD a person must have three specific symptoms in social communication and social skills and two or more in repetitive behaviours [6,8]. The severity levels for ASD have been described by DSM-V and are defined by the level of support level required (Table 1) [6]. General dental practitioner should be aware of the criterion for diagnosis of ASD, the depth and complexity of the disorder. Practitioners should also appreciate that dental management will differ depending on severity of ASD.

### ASD signs and dental concerns

In accordance with the above diagnostic criteria for ASD, a problem with communication means patients have difficulty with verbal and non-verbal communication. Patients may have difficulty understanding or relating to a person’s body language or unknown hand gestures and may become stressed [2]. However, not every person with ASD will have issues with language, and each individual’s ability will differ depending on the severity of their ASD [2,7,9,10]. ASD individuals may also have difficulty using language effectively when conversing, in particular the rhythm of sentences and nuances in vocal tone, such as sarcasm. The dental practitioner may encounter a number of different speech/communication pattern deficits that are related to the diagnostic criteria, some of these major issues are dealt in detail below.

### Repetition of phrases

ASD patients who can speak may say things that appear to have no

meaning, or out of context to the general topic of conversation. They will repeat words or phrases they have heard multiple times, such as phrases from television commercials; a condition called echolalia, which is either immediate or delayed [11]. Immediate echolalia is when the patient repeats the same phrase, words, or question they were just asked [6]. Delayed echolalia means that the person will repeat words they have heard at an earlier time [6]. Current literature suggests echolalia is a method of learning and retaining information about certain interactions so that they may be recalled when required, or used when the person does not know the correct response to a social situation [12]. Up to 75% of ASD patients’ exhibit echolalia, and research has found that those exhibiting echolalia are significantly more likely to be uncooperative in the dental chair ( $p=.005$ ) [13]. For example when asking a patient what flavour of prophylactic paste they would like, “Do you want mint or bubble-gum?” the patient may answer by repeating the whole question or just the last word “bubble-gum”. The operator must then determine if the request is genuine or only a repetition of the original phrase or questions. Rephrasing the question may help evaluate the patient’s understanding of the question (e.g. Do you want bubble-gum or mint?). If the response to the rephrased question is now “mint”, there is a possibility that there is a lack of understanding and that the question is only being echoed [13]. In the above scenario it may be necessary to enlist an appropriate response by showing the patient the available options and asking them to, “choose one” or “pick one.”

### Narrow interests and ‘savant’ skills

Some ASD patients may be particularly well spoken and may be able to read a topic that captivates them, but unable to hold a two-way conversation [14]. Alternatively, patients can be brilliant at a specific topic at a very young age. These Savant skills are quite rare, and do not necessarily affect dental treatment [15]. An useful strategy in managing ASD patients that appears very vocal or obsessed with a particular topic is to engage them with the topic and look for windows of opportunities to redirect the conversation so as to enable continuation of treatment (e.g. That’s really interesting but, let’s brush your teeth and then talk about it some more”) [1,7,16]. This helps engage the patient and build a perception that the dentist appreciates their interests.

### Uneven language development

Similar to the narrow interests, uneven language development can mean the person develops a detailed vocabulary in an area that they enjoy, but have a poor vocabulary in other areas. Often times ASD

**Table 2:** Non-Pharmacological methods to cope with sensory defensiveness in ASD patients in the dental environment.

| Dental situations causing sensory defensiveness   | Non pharmacological Methods to decrease sensory defensiveness   |
|---|---|
| High speed drills or suction high pitched noises  | -Use hand instruments to clean teeth and remove decay<br>-Visual Schedule/Pictures  |
| Sensitive to tooth polishing  | -Allow child to listen to calming or favourite music with headphones during treatment and while waiting in waiting room<br>-Have parent/guardian do deep pressure orally with electric toothbrush   |
| Dental chair changing position  | -Inform patient of what is about to happen<br>-Keep x-ray coat on patient to act as deep touch pressure<br>-Use pictures and visual schedule to show patient what is going to happen<br>-Visual Schedule/Pictures   |
| Taste of polishing prophylaxis paste or local anaesthetic gel                               | -Give patient choice of paste flavour by saying "Which flavour do you want, mint or bubble-gum, pick one"   |
| Dental light is too bright  | -Give patient tinted protective glasses<br>-Inform patient of what is about to happen<br>-Visual Schedule/Pictures  |
| Over reactive gag response  | -Avoid areas that cause gagging<br>-Inform patient of what is about to happen<br>-Deep touch pressure   |
| Generalised noises of the dental office are distressing (i.e. phone ringing, doors closing) | -Allow child to listen to calming or favourite music with headphones during treatment and while waiting in waiting room<br>-Keep x-ray coat on or have child chew something very chewy prior to appointment (deep touch pressure)   |
| Generalised anxiety   | -Allow child to listen to calming or favourite music during treatment and while in waiting room<br>-Short appointments<br>-Use firm touch whenever touching the child<br>-Allow child to bring favourite toy to appointment<br>-Give rewards to child to reinforce positive behaviour |

children do not respond to others talking to them, and may not even answer to their own name. ASD patients may also have difficulties following rules of language and Story Telling. Such delay in language development can make it very difficult for the dentist to communicate with the patient. For example, non ASD individuals will understand what the phrase, "I'm going to polish your teeth now" means and will respond appropriately, however many ASD patients find it difficult to think abstractly and will not understand this implication to lie down and open their mouth. Thus with ASD patients it is more effective to use short concise sentences that are very direct, such as "sit down", "open your mouth wide". When the patient understands the phrase use that one phrase all the time for each appointment, this keeps the language consistent and does not confuse the patient [16-18]. The tone of the dentists' voice will also make a difference if the instruction "sit down" is said in a sing-song voice then the patient may not interpret that as an instruction. It is best to use a deep direct tone and avoid being rude or loud when giving instructions [16]. Oftentimes especially on the first appointment with a new dentist, the patient may take a while to comprehend each sentence so it is best to wait patiently after giving each instruction or asking each question to allow the patient time to think and respond. In general it is better to avoid questions or requests that have a yes or no response such as, "Do you want to get on the dental chair?" If the patient response is "No", it may be very difficult to regain control of the appointment. Keep statements direct and do not say things that allow the patient to make decisions about treatment, this should be done with the parent or caregiver before the appointment starts [16,19,20].

A visual schedule may be a useful adjunct to the above techniques if the patient fails to respond adequately. A visual schedule also known as picture communications, are a series of pictures that depict the progress of the appointment [16]. The first picture may show the child standing and smiling next to the dental chair, the next will show them sitting in the chair, and then with the bib and protective glasses on. These pictures can be used to depict almost every dental situation.

### Poor non-verbal communication skills

Hand gestures are perhaps one of the more difficult communication skills that ASD patients find hard to learn and comprehend. ASD patients may become highly frustrated when explaining and discussing a topic that is ambiguous or scary, and in response to this frustration avoid eye contact, or make inappropriate vocal outbursts. It is important to understand that pictures can be one of the most effective ways for the dentist to communicate their instructions with ASD patients, but that it is also a good way for the patient to tell the dentist how they are feeling [21]. The patient or guardian may bring along a folder of pictures depicting certain emotions, alternatively keep a folder in the dental office to use if it becomes necessary.

### Sensory problems

Sensory problems are also included in the DSM-V as an additional problem ASD patient may present with. Most commonly, sensory problems in ASD patients are referred to as hyperacuity or hypoacuity to stimulation of the five senses, where patients sense the five senses (vision, auditory, touch, olfaction, taste) but interpret them unorthodoxly [22]. A range of disorders for this type of problem is collectively known as Sensory Processing Disorders (SPD). The most common SPD relative to ASD is sensory defensiveness, defined as an over-reaction to normal sensations [22]. Common reactions to distressing sensory input are outlined in Table 2. It is very important to respect the patients concerns and fears because they will become increasingly agitated and physically aggressive if the alarming stimuli are not removed [9]. Having the parent squeeze the child's hand can help decrease agitation [23,24]. Methods to cope with a patient who exhibits sensory defensiveness are shown in Table 2.

### Oral health issues

Currently there is debate on the caries and periodontal risk associated with ASD. Some studies have reported that ASD patients (mostly autism) experience a significantly higher decayed, missing

or filled (DMF) rate than non ASD individuals [31,32], whilst other reports indicate, no significant difference in caries risk when compared to non-ASD patients [33] [17,19,32,34]. It appears that the higher incidence of caries in some ASD patients is more likely due to poor oral hygiene compliance rather than a biological (enamel/dentine based) predisposition [35], which could also explain the higher incidence of generalised gingivitis in ASD individuals [18,35]. Poor oral hygiene compliance appears to be a relatively common behavioural issue with ASD children and further research should be undertaken to identify whether poor oral hygiene is a significant factor in caries prevalence [33,36]. Until research shows that ASD does or does not cause a biological risk for caries, it is best to place patients on a high-risk oral hygiene regime.

Other oral health issues include, drooling, tongue thrusting and difficulty swallowing; the cause of which appears to be poor muscle tone rather than excessive saliva production [33]. Orthodontic assessment is essential to monitor and treat protruded incisors, high arched palate and difficulty breathing. Increased wear facets (a common sign of bruxism/grinding) as well as erosion and hyper responsive gag reflex are also common [37]. Pouching food is also common, where patients leave the bolus in their buccal sulcus due to a lack of tongue control, increasing their risk of caries [18,38,39] so parents should be informed of this at every hygiene appointment. Self-injury is also a commonplace finding in ASD patients, both cutaneous and oral, and recurrent bruises, abrasions, cuts and oral ulcers should be viewed with suspicion [40]. Making sure parents check in the mouth at night and morning will help to keep track of the patient's behaviours.

### Management of ASD in the dental office

Management of ASD can be difficult without first understanding the different types of management available to the dental operator. Managing the ASD patient is not only about treating them in the dental chair, it is also about making sure the patient and their parent/guardian has the oral health knowledge to properly clean each day. There are two overarching methods of managing ASD patients: Pharmacological and Behavioural. Pharmacological management includes conscious sedation, and general anaesthesia. Behavioural management includes hand-over-mouth technique, getting acquainted appointments/familiarization, restraint, and deep touch pressure.

### Pharmacological management of ASD

Pharmacological treatment of ASD is usually prescribed by a Paediatrician and aims to improve mental, social and behavioural symptoms. Behavioural symptoms affiliated with ASD include repetitive behaviours that interfere with normal daily life, irritability, aggression, motor hyperactivity and/or inattention, and deficits in communication skills. Mirtazapine, a tetracyclic antidepressant, helps patients deal with anxiety, irritability, self-injury, and repetitive behaviours but results appear preliminary [25]. Irritability is believed to occur in 30% of children and adolescents with ASD [26] and can be dealt with reasonably effectively using antipsychotics [25]. Motor hyperactivity and/or inattention are considered common behavioural problems in ASD [11], however treatment is not highly efficacious often resulting in adverse effects; headaches, constipation, sleep disturbance and sedation [25]. Sleep disturbance can be an

issue if the patient is still in orthodontic growth and early cephalo-caudal growth assessment may aid the practitioner in preventing malocclusion. There is little pharmacologic research for treatment of social impairments in ASD, but some trials (not placebo controlled) have demonstrated improvements using selective serotonin reuptake inhibitors (SSRI) and antipsychotics [27,28] but others report there is no true substitute for educational and behavioural therapy for social and communication deficits [29]. Such data impacts dentists as early acquaintance with the dental environment may help reduce patients anxiety (i.e. starting at one year). Of clinical dental relevance is the fact that tricyclic antidepressants, SRIs and antipsychotics cause a significant reduction in salivary flow, with up to 27% of individuals taking TCAs reporting dry mouth [30]. Salivary substitutes, chewing sugarless gum, avoiding acidic foods or drinking water after eating acidic or 'sugary' foods can help alleviate damage to the dentition and such preventive methods should be taught to ASD affected individuals and their carers or families.

### Conscious sedation

Conscious sedation, such as nitrous oxide (NO) gas or benzodiazepine tablets (e.g. midazolam) is a method of relaxing the patient and increasing the pain threshold so that the patient can cope with dental treatment that would normally cause the patient extreme fear and/or anxiety. Many studies have been conducted on the effectiveness of conscious sedation as well as parental acceptance of conscious sedation versus general anaesthesia (GA). Often times parents request a GA for their children's dental treatment without knowing the risks associated and these should be outlined as follows: increased risk of adverse medical outcome, treatment will have to be more radical as patient will likely only be under GA once due to medical risk or financial cost (e.g. extractions, crowns), children who have conventional treatment tend to be able to return for preventive appointments and have lower fear and anxiety levels [53]. Operators should offer alternative to GA, like midazolam, benzodiazepines or NO and check for medication interactions.

### Behavioural management and therapy

It is accepted that mild anxiety can be normal when attending dental appointments, but when fear begins to affect the patients' oral health (i.e. not attending appointments, not having necessary treatment) then treatment of that fear is indicated [41]. This is often the case for ASD individuals for a number of reasons including a fear of the unknown, communication deficits, or concurrent mental disability. Many different pathways exist from which dental fear arises and understanding the cause of the fear may aid in treating it [42], but there has been little research into the pathways of dental fear associated to ASD [42]. In children, speech and language develop rapidly between the ages two and three [43]. Although not the case in ASD patients, such knowledge of the different strategies for behavioural management and therapy is required to facilitate adequate dental treatment. Such strategies include the hand over mouth technique (HOM), getting acquainted appointment, restraint, and deep touch pressure (DTP).

### Hand over mouth (HOM)

Communication problems and concurrent non-compliance are perhaps the most common issue experienced by operators when dealing with ASD patients. Authors report the benefits of special



**Table 3:** Recommended home drills to ensure better patient compliance.

|   |
|---|
| <ul style="list-style-type: none"> <li>• Use story books or videos such as those provided by the Autism Speaks Foundation™ to familiarise the patient with the dental environment (i.e. reception, chair, lights)</li> <li>• Use time indicators as it is important for the patient to realise that the appointment will not last forever and they can monitor the length of their appointment (e.g. stop watch, sand timer)</li> <li>• Use social stories or visual schedules to make the patient aware of why they need to go to the dentist and what is going to happen at their appointment</li> <li>• If this is the patient first appointment at a new practice, have a 'get acquainted' appointment before any treatment".</li> <li>• Use a power toothbrush at home as this will desensitize the patient to the noise and vibration of the dental instruments Teach the patient what 'open wide' means so that this is not a foreign phrase when the dentist uses it</li> <li>• Try different toothpastes at home to get the patient used to different tastes and textures</li> <li>• Make sure the patient is aware they are allowed to take their favourite toy with them to the dentist as this can make the experience more 'normal'</li> </ul> |
|---|

**Table 4:** Indications and contraindications of restrain as a method of managing ASD patients.

| Indications  | Contraindications  |
|--|--|
| <ul style="list-style-type: none"> <li>• Patient requires immediate diagnosis and/or limited treatment and cannot cooperate because of lack of maturity or mental or physical disability</li> <li>• The safety of the patient, staff, dentist or parent would be at risk without restraint</li> <li>• The sedated patient requires limited stabilization to help decrease untoward movement</li> </ul> | <ul style="list-style-type: none"> <li>• The non-sedated patient is cooperative</li> <li>• The patient cannot be immobilized safely because of associated medical or physical conditions</li> <li>• The non-sedated patient with elective treatment requires lengthy appointments</li> <li>• The patient has experienced previous physical or psychological trauma from physical restraint unless no other alternatives are available."</li> </ul> |

visual aids and rewards at the end of the child's appointment [9]. Parents and caregivers seem to concur that rewards are a useful tool not only to enhance co-operation during treatment but also to build an environment of trust [46]. Rewards should, however only be utilised when acceptable or improved behaviour is displayed. One technique that has been taught in University settings for many years is the 'hand over mouth' (HOM) technique. Over the last two decades the literature has seen a decline in its appropriateness and acceptance [19]. Accordingly in May 2006 HOM was removed from the list of recommended advanced behavioural management techniques at the General Assembly of the AAPD (American Academy of Paediatric Dentistry) Annual Session [20].

### Getting acquainted appointment/familiarisation

To modify social aversion experienced SCDA member's report they prefer to either give special instruction to parents before their child's treatment (78%) or allow parents to accompany their child in the operating room (90%) [9]. Less common techniques were letting the patients observe other children (47.6%) or letting patients observe their parents (38.7%) [9]. 71% also used familiarisation visits to calm the child before the first appointment, by which the patient merely meets the staff and sits in the chair for their first appointment. Interestingly, the child's favourite music or video was only considered by a few as method to calm the child [9,46]. The authors of the current study suggest parents should engage their children with photos or positive stories about the dental office ('show and tell') as a method of increasing familiarity prior the appointment [46]. Thus the initial appointment, often known as the 'get acquainted' appointment, should be used as a trust building exercise between physician and patient and all of the above techniques should be employed to discover which one works best as each child is unique.

### Deep Touch Pressure (DTP)

DTP is a form of tactile sensory input, most commonly provided by hugging, used to alleviate anxiety and appears to be especially efficacious in ASD patients though results are preliminary [23]. Possible anxiolytic effects of DTP could be useful in minimally invasive treatment however there are questions on clinical usefulness and further research is required to determine its effectiveness in the dental office [17,19,24].

### Parents/carers and ASD

Often times parents, carers or guardians will try to avoid telling the ASD individual that they have a dental appointment until the day of the appointment to avoid upsetting the patient. If the patient also has a phobia or fear of the dentist it may be helpful for the parent or carer to be mindful of the nature of dental fear so that they can utilise techniques that address individual specific fear [42,56]. Regardless of whether ASD patient are fearful or anxious of dental procedures, it is generally accepted that such patients be modelled (familiarized /desensitization) well in advance (e.g. a week prior) to allow for better adaption and alleviate emotional distress that could be associated with a procedure [7]. It has been reported that, the parent, carer or guardian could play an active role in this familiarization/densitisation process by implement a few simple home drills (Table 3 ) prior to the appointment to ensure the patient is as comfortable as possible [7,9].

### Restraint

Restraint has been reported to be useful in some situations but it is a controversial subject, there is also little data available to indicate its benefits. In the past, papoose boards have been advocated [32,47], but the majority of current literature disapproves of physical restraints [17,48]. Approval by the caregiver/parent is essential for restraining [38], however in most cases not forthcoming [49,50]. The American Academy of Paediatric Dentistry (AAPD) notes that the use of physical restraint can be physically dangerous if the restraint device interferes with breathing or circulation, and psychologically damaging making the development of dental phobia significantly more likely. It would hence, be important to understand the indications and contraindications of restrain as a method of managing ASD patients (Table 4) [51].

### Conclusion

This review provides dental practitioners with a basic understanding of how to manage ASD patients in the dental office. Successful management techniques may include visual schedules, distraction techniques, acquaintance appointments and deep touch pressure. It is however important to acknowledge that ASD patients are complex, and dental practitioners should be willing to change/alter their management technique based upon the patient's reactions.

Working with ASD patients can be very rewarding for the dental team but it can also become very stressful if appropriate management techniques are not employed.

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