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- Results: present the results of the study, without interpretation.
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The abstract should be 250 words or fewer. It may be either structured or unstructured. If structured, use the same sections as described below for the components of the report (Introduction, Case Presentation, Intervention and Outcomes, Discussion).

Case Report Components

- **Introduction:** State why this case is unusual or important.
- **Methods:** describe the search engine and key words used to review previously published literature on the subject
- **Case presentation:** Provide a brief summary of the pa-

tient's presenting demographics, other relevant characteristics, complaint(s) and related symptomatology.

- **Intervention and outcomes:** Describe the course of treatment, including frequency and duration, and summarize the patient's clinical outcomes, using recognized outcome measures if possible. Include whether informed consent was obtained and if there were any adverse events reported.
- **Discussion:** Succinctly state the important aspects of the case, in terms of its implications for patient care in general, or for specific patient populations or conditions. You may also compare/contrast the case to other cases in the published literature. Be cautious about overstating the importance/implications of your case.

Evidence-based Case Report Instructions

An Evidence-based Case Report (EBCR) is NOT the same as a traditional case report. The EBCR focuses on an answerable clinical question, how it was explored in the search, appraising the results and how it applies to the case, along with the integration of this information with the patient interaction. The final stage in this process is to audit the results.

These are the steps to include:^{1,2}

- Brief summary of the chief complaint: 50-100 words
- Briefly describe the clinical case: 250-400 words
- Explain how you developed the clinical question: 200-300 words
- Explain your search for evidence (key words, databases used, number of articles retrieved): 50-100 words
- Evaluate the articles retrieved: critically appraise the evidence for validity and relevance: 200-300 words
- Describe how you made your clinical decision by applying these findings to the case, including how you considered and integrated the patient's preferences and values: 250-400 words
- Evaluate your performance: 50-100 words

1. Heneghan C, Badenoch D. *Evidence-based Medicine Toolkit*, 2nd ed. Oxford, UK: Blackwell Publishing, 2006.

<http://onlinelibrary.wiley.com/doi/10.1002/9780470750605.index/summary> (download pdf of "all chapters" for free copy of the publication)

2. Jones-Harris AR. The evidence-based case report: a resource pack for chiropractors. *Clin Chiropr* 2003;6 73-84. (download for free from www.chiro.org/cases/FULL/Evidence-based_Case_Report.pdf)

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Review an example of an EBCR at:

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Iran J Pediatr. 2010 Sep; 20(3): 261—268. Evidence Based Medicine in Pediatric Practice: Brief Review

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3446038/>

J Can Chiropr Assoc. 2014 March; 58(1): 6—7. **Evidence-based case reports**

<http://pubmedcentralcanada.ca/pmc/articles/PMC3924510/>

3 BMJ. Vol 7, Issue 3, 2002, **Evidence-Based Medicine in Practice: EBM Notebook**

<http://ebm.bmj.com/content/7/3/68>

A turning of the page...2020 to 2021

By Sharon A. Vallone, DC, FICCP

"This is going on and on and on...when will this end?" Is that the echo of my patients, friends and families voices or is it my own voice? Who knew we'd be here today when this all started like a tsunami in March of this year? One of my colleagues, describing her emotional turmoil during the last 10 months, coined the phrase, "Roller-Covid", likening the experience to an amusement park ride that scares the living daylights out of you.

We were taken by storm. An overabundance of "news" with little science at the ready. We were caught unprepared for what was to ensue despite watching our European neighbors struggle through it in Italy. Then, when the fear settled and we had made our decisions about our family, our patients, our protocols and practice guidelines, my hope is that you recognized that the level of patient care was going to shift into high gear as stress levels escalated and the experience of daily trauma, toxin and thought would increase the demand for what you, as their chiropractor, could offer your patients when you were ready, while keeping yourself, your staff and your patients, safe, healthy and educated.

And then, I hope you began to feel the spark of creativity in your life and in your practice.

Maybe you decided to spend more time with your children who were now facing virtual school, cut off from their comrades, their regular social, religious, cultural and athletic activities and the one-on-one interaction so necessary between students and teachers. Perhaps you put your time into filling this gap for your children and taking this time to build stronger family bonds and to help them understand how to face challenges in their young lives.

Perhaps you began blogging or sending newsletters to your patients with a wealth of information on positive thoughts, self-care, breathing, good nutrition and getting outdoors and exercising. Maybe you texted daily with patients who you knew were shut in and in need of connection. Maybe you created a regular podcast to reach an audience who had the time to listen and so needed the ongoing support you could provide them in these uncertain times.

Perhaps, in addition to your office hours, you began scheduling Telehealth visits with patients whose level of caution prevented them from coming to your office but who still wanted the benefit of your wisdom about so many questions they have as their children grow and develop.

And some of you turned to the pen (or the iPad or computer). This issue includes a few opinion articles written by individuals to support the field practitioner exploring topics often brought to our attention during our patient encounters or to broaden our horizons with useful information to share with parents either in office or on-line to support their own musculoskeletal health with proper ergonomics or their children's safety and normal development.

My wish for you in this coming year is to be surrounded in love, a return of resilience, that you may enjoy a revitalization of your life, your passion for chiropractic and strength in your convictions. May you all be blessed in this coming new year as you continue to dream and achieve and live life to the fullest. May we never forget to be filled with gratitude for this life and this gift that we have been given.

When this has gone on long enough, we will see that we have been malleable enough to find our equilibrium again and continue to provide the essential health care that our patients have come to expect and rely on - chiropractic!

Parent reported outcomes of infant chiropractic care in a teaching clinic and private practices utilizing the United Kingdom Infant Questionnaire (UKIQ): A survey

By Hazel Mellars, MSc, Jasper Durville, MSc, Rogier Koel, MSc, Agnes Laan, MSc, Kristoffer Sandhauge, MSc and Joyce Miller, DC, PhD

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ABSTRACT

Objective: There have been few investigations into parent report of outcomes for chiropractic care for infants. The goal of this survey was to implement an infant outcomes instrument in a teaching clinic along with private chiropractic practices to observe the demographic profile of patients and any unique observations in outcomes. **Method:** Infants aged up to 12 months presenting to the AECC University College (AECC) teaching clinic and to private chiropractic practices in the UK were eligible for inclusion. Mothers completed valid and reliable questionnaires which measured characteristics before and after chiropractic care. **Results:** A total of 479 infants from the AECC were included, and 19 from private clinics. Of these, 297 (61%) completed follow up forms at the teaching clinic and 15 (79%) completed follow up forms in the private clinics. The most common complaint for patients presented to the teaching clinic was a feeding problem (40%) compared to private clinics where the main complaint was a difficult birth (27%). The AECC had a mean satisfaction score of 9.5/10 (10 being completely satisfied) and the private clinics had a mean satisfaction score of 8.3/10. Scores of Parent Global Impression of Change (PGIC) showed that at least 86% of infants improved. There were no adverse events. **Conclusion:** Overall the parents in this study reported high satisfaction with the care their infant received, along with improvement in their infant's complaints. However, there were insufficient numbers from private clinics to make any representative conclusions about similarities or differences between a teaching clinic and private chiropractic clinics. Implementation of a parent report of outcomes in infant practice was feasible.

Key words: PROMs (patient reported outcome measures), infants, chiropractic, outcomes instrument

Introduction

Infants use more health care than any other age group.¹ Symptoms such as excessive crying, feeding or sleeping account for approximately 47% of problems at clinical presentation in the first five months of life.¹ Parents access chiropractors regularly for these issues and the use of complementary and alternative medicine (CAM) continues to rise across the globe and millions of treatments are delivered annually.² Nevertheless, research is scant for such care, and often questioned.³ Although medical referrals for chiropractic care are high,⁴ satisfaction with chiropractic care for children has rarely been studied.⁵ Patient satisfaction has become widely used in order to gain a better understanding of treatment quality in all types of clinical practice and its importance has been recognized by several authors.⁶ Also, there are few prospective studies concerning adverse events

in chiropractic treatment for infants, although chiropractic care for children is generally considered safe.^{7,8,9}

It is a public expectation that all practitioners deliver evidence based care of high quality and this should be available profession-wide. In other words, regardless of specific techniques used by practitioners to treat their pediatric patients, treatment outcomes should be reproducible across the profession. Research may have revealed a growing interest for CAM therapy and growing evidence of patient satisfaction but has yet to prove if the outcomes are equivalent across practices. It is natural for a patient to expect the same results from therapists practicing the same discipline. Is the chiropractic profession able to deliver treatments interchangeably and achieve an equal

standard of care? Variations between clinics and even therapists in the same clinic can be significant.²

In order to address the general lack of research in chiropractic care for infants, a research protocol was designed to implement a parent reported outcomes measure (PROM) into routine chiropractic clinical practice in a teaching clinic along with private clinics during a thirteen week time period.

Methods

This was an observational study using a Parent Reported Outcomes Measurement (PROM), the United Kingdom Infant Questionnaire (UKIQ), a reliable, valid instrument for the infant patient.¹⁰ Since PROMs have become more important in measuring healthcare quality than outcomes such as physiological reports,¹¹ but have seldom been used for infant care, it was decided to implement this in practice. The aim of this project was to test the practicality of usage of an infant PROM in chiropractic clinical practice, both in a teaching clinic and in private practice. It was decided to test for feasibility of incorporation into practice and to look for any variability in presentations or outcomes between a teaching clinic and private clinics (Box 1).

The research questions:

1. Is a parent reported outcomes instrument feasible to implement in chiropractic clinical practice?
2. Is there a different demographic profile (age, gender, type of birth, complaint) in infants attending a chiropractic teaching clinic vs a chiropractic private clinic?
3. In infant patients who attend a chiropractic clinic, is there a difference in outcomes (by parent report) at baseline/intake versus follow-up in a teaching vs private clinic?

Box 1. The research questions.

In order to answer the research questions, private chiropractic practices were recruited through a pediatric conference, asking for volunteers. Only those clinics in the UK that expressed an interest were invited to participate in the study, and 15 volunteers were contacted via email. Those that replied were sent hard-copies of the United Kingdom Infant Questionnaire (UKIQ) intake and follow-up forms, plus an accompanying letter with instructions in order to implement the questionnaires in a consistent manner. The questionnaire was also introduced into the AECC University College (AECC) teaching clinic, where receptionists were asked to distribute the UKIQ together with the other routine forms on the first patient visit. The student interns were then instructed to hand completed questionnaires in to the research supervisor. Private clinics were given self-addressed envelopes to return the surveys at the end of the test trial. They were given contact

information if there were any questions or a need for more forms.

Mothers were asked to complete the 12-question instrument at initial presentation at either the teaching chiropractic clinic, or a private chiropractic clinic. Then a 13-question questionnaire was completed at the 4th treatment visit/follow up, or at the time of discharge from care, whichever occurred first. The first twelve questions were identical at presentation and follow-up. The thirteenth question was the Parent's Global Impression of Change (PGIC), a gold standard reference used to document change over treatment time.¹² Collection of demographic data included: age, gender, type of birth, place of birth, feeding type, infant complaint, medications taken, sleeping preferences, any recommendation for chiropractic care and which healthcare providers had previously seen the infant for the current complaint.

Inclusion criteria were: English-speaking mothers who presented their infant to a chiropractic office and that the age of the infant was up to 12 months of age. The exclusion criteria were: parents who could not speak English, child over the age of 12 months, or those who did not wish to participate. Parents signed a consent form to be included in research before being asked to complete the questionnaire.

Completed questionnaires from the AECC University College teaching clinic were stored in a locked cupboard within a locked room to preserve safety and confidentiality. A reminder email was sent to the private chiropractic participants to encourage them to continue using the questionnaires for as long as possible, and a final reminder was sent with a set deadline date of return. Questionnaires from the private chiropractic clinics were returned via the postal service in batches and stored in the same secure area.

Feasibility of implementation was tested by number of clinics that enrolled in the study and the number of intake and follow-up forms returned in the time period. The other research questions were tested by results of the intake and follow-up forms collected in the AECC clinic and those returned by mail from the private clinics.

After both the intake and follow-up questionnaire were collected, the data were entered into Microsoft Excel®. A data key was developed relating to the Excel spreadsheet, so it was clear which column referred to which question in the questionnaire. From Excel, descriptive statistical analysis was completed to calculate percentages and means of demographic variables. For comparisons of outcomes between the private clinics and the AECC teaching clinic, descriptive statistics were used to analyze the data. The AECC Director of Research assisted the team in data analysis, using SPSS V. 21®.

The study was approved by the AECC Research Ethics Sub-Committee. All data were completely confidential. There was no way to identify any specific patient from any of the data collected in the forms. Only the members of the research team were able to access the questionnaires as they were stored in a locked room, which was only accessible by authorized people, all in line with the Data Protection Act (1998).

Results

Six private clinics provided 19 questionnaires, an average of 3.2 per clinic whereas the teaching clinic provided 479. There were 297 follow up questionnaires (60.6%) from the AECC teaching clinic and 15 from the private clinics (78.9%). Even though the number of responses was low from private clinics, and thus may not warrant further analysis, the results are depicted in tables in order to learn as much as possible from the data. Table 1 shows the characteristics of the child on presentation to the clinics. Tables 2 and 3 show intake and exit scores for the two types of clinics. Table 4 shows global impression of change and Table 5 shows side effects. Tables on following pages.

There were 1,004 complaints for 474 infants at the AECC (on average 2.1 complaints per infant). Private practices had 32 complaints for 18 infants (on average 1.8 complaints per infant).

In general, patients in the private clinics were slightly older, sicker, had more medically assisted births and had seen more medical clinicians prior to presentation at the chiropractor. At least 86% of the parents reported improved symptoms in the baby and were highly satisfied. There were no adverse events and side effects were mild.

Discussion

The purpose of this research was to test the feasibility of implementation of an infant outcomes instrument in chiropractic practice, in a teaching clinic and in private clinics. The second purpose was to collect the profile of infants who are presented to chiropractors and what the parents report regarding their care outcomes. These goals were essentially met. However, the response rate from private clinics was too low to form representative samples for statistical comparison. However, the over-all number of infant data collected was approximately 500, so the parent report of outcomes may be representational of infant patients that are presented to chiropractors.

It is important for all clinicians to evaluate the outcomes in the patients that they serve. Outcome measures have been used in chiropractic care for many years and are considered an important part of modern practice.¹² However, the purpose of this study was primarily to determine feasibility of using a wide variety of practitioners to complete parent reports.

If data collection of outcomes could be found feasible in a spectrum of clinics, this could become a key part of patient-centred care for infants, as has been shown for adults.¹³ The underlying theory of this application is that regular, ongoing feedback from patient reported outcome measures (PROMs) to clinicians will enable both practitioners and patients to reflect on whether the treatment provided is working,¹⁴ a key part of patient-centred care.

The private clinics provided far fewer questionnaires than the teaching clinic. However, the private clinics provided a higher follow-up rate than the teaching clinic, possibly indicating that invested clinicians monitor the patient's follow-up more closely than interns, or possibly that private clinics offer shorter episodes of treatment. Nevertheless, research participation is essential in the endeavor to answer important research questions. Is there a gap between clinical practice and clinical research? It would seem that the challenge with clinician's participation in clinical research is not isolated to research carried out by the chiropractic profession. Medical research has found that there are barriers to practice research in the Western medical model. For example, in a study of barriers to practice research, 37% of German General Practitioners (GPs) responded, similar to the response rate in this study of 40%. While nearly all GP respondents considered the research important, over half (56%) would not participate in future research projects.¹⁵ Some of the barriers were time constraints, lack of staff and training, worry about the impact on doctor-patient relationship, concern for patients, lack of rewards and recognition.¹⁶ Some clinicians may feel overwhelmed by research requests.¹⁷ Further, additional work may be challenging to take on in today's healthcare environment; something that may be especially true for non-researchers.¹⁸ Even with a great respect for research, time constraints can hinder clinicians in reading and implementing research,¹⁹ let alone participating in it.

Researchers must take full responsibility for the failure of private practice clinicians to participate. Motivation driven by the research group has been recognized as more important when recruiting than financial incentives, the research topic, or research experience.²⁰ Attention should be paid to factors that may promote participation in future research projects. By seeking clinicians supportive of research, giving clear instructions, establishing expectations (including amount of time required), and maintaining frequent contact combined with several reminders, might have lead to higher participation. Ensuring clinicians have a better understanding of how the information provided will be put to use, could promote participation.²¹ The time frame may have been too short for the practitioners to establish a research rhythm in their practices. More time could have improved the responses in this study.

DEMOGRAPHIC PROFILE	TEACHING CLINIC (n=479)	PRIVATE CLINIC (N=19)
Mean Age	7.2 weeks	10.9 weeks
Mode (most common age)	3 weeks	8 weeks
Age Range	0-47 weeks	1-45 weeks
Gender	56% Male	74% Male
Mean maternal age	32 years	36 years
Maternal age range	17-47	30-49
Referral		
from any health care Practitioner	73.5%	23.5%
Friends & family	25.4%	76.5%
Per cent assisted birth	65%	84%
How baby fed		
Breast fed	53.6%	68.4%
Formula fed	26.5%	26.3%
Both	19.9%	5.3%
Presenting complaints	N; %	N: %
Crying	147; 31%	5; 26%
Feeding	188; 39.7%	3; 16%
Sleeping	116; 24.5%	3; 16%
Uncomfortable supine	153; 32.3%	4; 21%
Unable to turn head both sides	36; 8%	5; 26%
Difficult birth	127; 27%	6; 32%
Head shape	72; 15%	0; 0%
Check-up	132; 28%	3; 16%
Tongue-tie	3; 0.6%	1; 5%
Other MSK	18; 4%	1; 5%
Reflux	4; 0.8%	1; 5%
Wind	7; 1.5%	0; 0%
Weight	1; 0.2%	0; 0%
Preferred Sleep Position(s)		
Back	270; 57%	13; 68%
Front	94; 19.8%	5; 26%
Right	100; 21.1%	3; 16%
Left	83; 17.5%	5; 26%
Upright	23; 7.6%	1; 5%
On parent's chest	4; 0.8%	0; 0%
Medications given	62%	58%
Mean number medications per child	2	2.5
Largest number of medications per child	7	6
Other clinicians seen for same condition	Teaching Clinic	Private Clinic
GP	69; 21.9%	9; 47.4%
Paediatrician	17; 5.4%	2; 10.5%
Consultant	9; 2.9%	0; 0%
Midwife	113; 35.9%	2; 10.5%
Hospital	18; 5.7%	3; 15.8%
Lactation consultant	49; 15.6%	2; 10.5%
Chiropractor	21; 6.7%	5; 26.3%
Physiotherapist	4; 1.3%	0; 0%
Osteopath	6; 1.9%	1; 5.3%
Health visitor	65; 20.6%	2; 10.5%
Tongue tie specialist	9; 2.9%	0; 0%
Homeopath	0; 0%	1; 5.3%
Dietician	0; 0%	1; 5.3%

Table 1. Demographic profile of infants presented to chiropractic clinics, n=498. Key: Mothers could select more than one presenting complaint and sleep position.

AECC	Intake N; mean score	Follow up N; mean score (%change)
Feeding	455; 3.5	283; 1.2 (66%)
Sleeping	475; 3.8	283; 1.6 (58%)
Crying	457; 3.7	282; 1.4 (62%)
Crying time	456; 3.5	283; 1.5 (57%)
Consolability	474; 3.8	283; 1.6 (58%)
Supine	456; 4.3	283; 1.5 (65%)
Pain	466; 4.2	282; 1.6 (62%)
Maternal Depression	456; 2.3	282; 0.7 (70%)
Quality of life	453; 2.7	281; 1 (63%)
Head turning to both sides	450; 3.5	281; 1.4 (60%)
Tummy time	470; 4.9	281; 6.5 (33%)
Satisfaction	N/A	97; 9.5

Table 2: Mean change in scores (0-10) of complaints at the AECC teaching clinic.

Private	Intake N; mean score	Follow up N; mean score (%change)
Feeding	18; 2.4	14; 2.4 (0%)
Sleeping	18; 3.3	14; 2.6 (21%)
Crying	18; 3.7	14; 2.4 (35%)
Crying time	18; 3.3	14; 2.0 (39%)
Consolability	18; 3.8	14; 2.9 (24%)
Supine	18; 4.2	13; 3.0 (29%)
Pain	18; 4.1	14; 1.9 (54%)
Maternal Depression	19; 1.9	14; 1.2 (37%)
Quality of life	19; 2.4	14; 2.1 (13%)
Head turning to both sides	19; 5	14; 2.8 (44%)
Tummy time	18; 2.7	14; 3.6 (33%)
Satisfaction	N/A	14; 8.3

Table 3: Mean change in scores (0-10) in the intake) and follow up questionnaires at the private clinics (N=19).

	AECC (N=274)	Private (N=14)
1. Worsened	2; 0.7%	1; 7.1%
2. No change	5; 1.8%	1; 7.1%
3. A little better	9; 3.3%	2; 14.4%
4. Moderately better	17; 6.2%	3; 21.4%
5. Better and a definite improvement	156; 57%	6; 42.9%
6. Completely better, like a different baby	85; 31%	1; 7.1%

Table 4: Parent Global Impression of Change (PGIC) scores at the AECC teaching clinic (N=274) and at the private clinics (N=14).

	AECC (N=171)	Private (N=13)
Adverse event	0	0
Side effects	8; 4.7%	4; 30.8%
No side effects	163; 95.3%	9; 69.2%
1	Slightly more unsettled after treatment	Bit more fractious after treatment
2	Not described by parent	Little fussy after treatment, however, hard to tell as medi- cation had increased as well
3	Crying a little more	Increased crying in evenings and during treatment
4	Grumpy, irritable in the evening of treatment	In last few days she has rejected the bottle, gets very distressed
5	Sometimes a bit more agitated on the same day of treatment	
6	Grumpy following day	
7	Small amount of crying, settled quickly	
8	Sleeps better	

Table 5: Number of adverse events and side effects recorded at the AECC teaching clinic and at the private clinics, including the reported side effects.clinics (N=14).

It is impossible to place any emphasis on the private care results when using such low numbers (n) as low numbers when averaged, tend to skew the means. However, in general, the differences between the teaching clinic and private clinics were small. Satisfaction rates of care were very high in both types of clinics. Likewise, more than 85% of parents reported improvement in their child's condition in both types of clinics. Satisfaction rates are generally linked to improvement.⁵

Whether there was a difference in actual practice between the clinics is unknown. Across professions, services tend to be delivered somewhat differently between providers. In manual therapy, a uniform and identical approach to musculoskeletal complaints is unlikely. There are variations in patient demographics, including presenting complaints and diagnosis prevalence that may lead to some clinicians

being more experienced with certain presenting complaints and required therapy.²² Pohlman and her colleagues also reported several demographic differences between chiropractors offering chiropractic pediatric treatment.²³ Factors such as amount of time spent in direct patient care, treatment techniques, employment of chiropractic assistants, weekly work hours, number of patients, age, and degrees held all may be implicated in the types of care on offer. Furthermore, the teaching clinic offers a specialist interdisciplinary breastfeeding clinic which might serve to attract those types of cases, possibly explaining why the presentation of babies with suboptimal breastfeeding was so high.

Assisted birth presentations were over-represented in both clinics. At the AECC, 65% had assisted births, compared to the private clinics with 84%. In the UK, 59% babies studied had a normal vaginal birth in NHS hospitals.²⁴ The population presenting to these clinics have approximately double the rate of assistance than the average baby in the UK. It was therefore reasonable that birth trauma was such a common complaint, the most common complaint in the private clinics. Parents (and clinicians as there were many medical referrals to both clinics) seemed to recognize that when there has been a strain or physical stress on the baby, that musculoskeletal type of care, such as chiropractic care, might be helpful. There were more medical referrals to the teaching clinic, probably because it is known in the community. Virtually all of the infants had visited one or more types of medical practitioners before presentation at the chiropractic clinics, indicating shared care was the norm.

As a consequence of their medical treatment, both clinics saw about a third of infants using two or more types of medication. One baby presented had used seven medications. There is wide concern in medicine about the over-use of off-label prescriptions in the pediatric population, considering the lack of evidence for safety and efficacy required by regulatory standards.²⁵ It is important that all clinicians observe the patient for possible side effects of medications.²⁶ According to the World Health Organization, over the counter medicines are also readily accessible, but their use for children is generally not evidence-based and often inappropriate.²⁷

Adverse events in chiropractic care for children are rare.^{7,8,28} In this research, no adverse events were reported. There were, however, mild side effects such as increased crying for less than a day and better and more sleep. Chiropractic treatment appears to cause fewer side effects when delivered by qualified chiropractors than by students.⁸ However, the opposite was found in this study. At the AECC, 5% of infants reported a side effect, compared to

31% at the private practice clinics, which could be due to the differing age group or level of birth trauma, or else an artifact of the small numbers. It is known that about a third of adults experience mild side effects with chiropractic care. It will be interesting to determine with larger samples whether this occurs with infants as well.

One of the main objectives for current chiropractic research is to document any benefits for public health for our patients. A key public health issue for infants is Back-to-Sleep.²⁹ Despite the importance of supine sleep, just under half of AECC-treated infants and about a third in the private clinics did not sleep supine, and commonly presented for this concern. This is important because the "Back to Sleep" campaign, which educates parents that their infants should sleep supine, has been successful by decreasing mortality from sudden infant death syndrome (SIDS) by more than half.³⁰ According to Public Health England (2015), it is a leading cause of infant mortality, and current advice for safer sleeping is to have the infant sleep supine.²⁹

Infants may not sleep supine due to discomfort in their musculoskeletal system³¹ along with their inability to turn their head both ways. These issues are key areas for chiropractic treatment to be beneficial in the support of public health. There were excellent improvements in supine sleep, complaints of infant pain, ability to rotate the head in both directions and crying time and consolability along with breastfeeding in this study, all key elements in public health support for infants.

Limitations

The low return of surveys in private practices was likely due to lack of research experience and time constraints and poor support. Hence, the results from the private clinics may not be applicable to the wider population. There are many impediments to implementation of outcome instruments in private practice and researchers can assist in resolution of those issues. There were no reported problems with the instruments implemented in this study.

Conclusion

In this study of outcomes of chiropractic care for infants presented to a teaching clinic and to private clinics showed very high satisfaction ratings from the parents along with good improvements in the infants' complaints with no adverse events. The UKIQ is a promising tool for measuring outcomes in a conservative practice. Because private practices participated at a low level, further efforts should be made, including better training, more time and electronic questionnaires to encourage higher response rates. Measuring outcomes is a key component of patient centered care. In this study, parents reported that chiropractic care was both safe and effective for their infant.

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Maternal perceptions of a breastfeeding clinic: A protocol for a service evaluation

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Introduction

There is increasing interest in the collection of data from routine practice. This provides information from a key area of Evidence Based Practice, the patient's point of view. All chiropractic offices, no matter how small, can participate in improving the understanding of their patient's viewpoint. Nowhere is this more important than in collecting the mother's perception when treating the infant with suboptimal breastfeeding. This protocol for a service evaluation is presented so that other clinicians can see that this type of research can be implemented into routine practice and lead to a better understanding of what is important to the mother and her satisfaction rate with the clinical encounter.

Background

Breastfeeding has been shown to have numerous health benefits for both mother and child. This includes the child's decreased risk for: respiratory and ear infections; atopic dermatitis; gastroenteritis; necrotizing enterocolitis, type 2 diabetes, and sudden infant death syndrome.¹ In the mother, breastfeeding reduces the risk for breast cancer.²

Because of these positive effects, Healthy People 2020 Breastfeeding Objectives recommends to 'Increase the proportion of infants who are breastfed' in its goals.³ Concurrently, the UK Baby Friendly Initiative (BFI) is undertaking a project that identifies what actions are required to improve and sustain scaling up programs that promote breastfeeding rates.⁴ This project has stemmed from the Call to Action campaign by UNICEF and BFI collaborative which as part of a global partnership with the World Health Organization (WHO) addresses public services to better support families with feeding their children to get the best possible start to life.⁵ One important aspect of the international campaign to improve breastfeeding rates is to pay attention to the needs of mothers. All clinicians and clinical services need to support this vulnerable population through the use of evidence-based practice.

Evidence-based practice is patient-centered care that is essential for all clinicians.⁶ In order for health care workers to be evidence-based practitioners, they need to consider the best available evidence, consider their clinical experience and hear and understand the patient's choice and values. It is that final component that is often left behind when evidence-based practice is being translated into clinical

practice. Asking the patient (in this case the parent) is why this study is important. The focus of this study is the perceptions of the mother who attends the clinic. Her voice is essential to providing the final component of evidence-based practice in order to be translated into best clinical practice.⁶

It is well understood that breastfeeding is intimately connected with growth and development, settling, bonding and attachment in the earliest relationships.⁴ Families often consult chiropractors for babies who are unsettled and have difficulty breastfeeding.⁷ It is also known that lactation difficulty is one of the most common reasons breastfeeding is not initiated or sustained.⁸ Manual therapy has modest evidence indicating it can solve an infant's biomechanical problems that either cause or lead to lactation difficulties.⁹

There is currently insufficient high-quality evidence that suggests chiropractic care helps support breastfeeding practices. Further research and analysis are needed to understand the key variables that relate to breastfeeding problems and the extent to which chiropractic care can be a positive influence. Designing practical pragmatic research to implement into routine chiropractic clinics that manage breastfeeding cases provides an opportunity to fill some of the gaps in the research literature. The primary research question is this: In a chiropractic clinic that manages breastfeeding problems, what is the perception of the mothers of that care? The specific questions investigated in this study are:

- 1) What is the experience of the mother in the initial visit to the clinic?
- 2) What is the mother's satisfaction rate?
- 3) What are the musculoskeletal issues for the infant presented to the clinic?
- 4) Are the cases presented relevant to the clinic's remit?

This study aims to answer those questions in order to better understand the mother's perception of the clinical encounter and to enhance the service providers ability to better design their service and care to respond to the needs of the breastfeeding dyad, the mother and infant. The ultimate objective is to support mothers with their breastfeeding goals and attain better breastfeeding rates which meet public health guidelines. This study will ultimately result in more patient-centered care and improve the evidence base for practice.

Research design/methods

This study is a service evaluation. A service evaluation is important in healthcare because it supports an evidence-based approach to practice delivery.¹⁰ It is used to assist in judging how well something is working. It can inform decisions about the effectiveness of a service and what changes could be considered to improve service delivery.¹⁰

As a service evaluation, the survey plans to evaluate how well the service is achieving its intended aims.¹⁰ It is undertaken to benefit the mother/infant dyad using the clinic and the survey is designed and conducted with the sole purpose of allowing the mother to judge the current initial service. A face-to-face survey questionnaire was considered to be the most appropriate form of research to be undertaken for this type of study.¹¹ The data collected are designed to represent a 'snapshot of how things present in a specific time' and not to manipulate variables. This will be a descriptive study which is considered well suited to survey data collection as it explores aspects of a situation or provides an explanation to a clinical approach.¹¹

To answer the research questions, intake and exit surveys have been designed to 1) ask the mother her reasons for attending the clinic and 2) ask the mother whether the service met her expectations and give her satisfaction rating and perceptions of the service. Another form, to be used by the clinician, will detect the musculoskeletal health of the child and the indications for the care required; this will determine the demographic and musculoskeletal health profile of the child, key factors in whether the case presented is relevant to the remit of the clinical expertise.

The three instruments used in this research project can be seen in Box 1, Box 2 and Box 3 (following page). To develop these instruments, the researcher reviewed the chiropractic and osteopathic literature for the treatment of breastfed babies. This resulted in no reliable or valid instruments that could be used for this research project. The design of these three instruments was based on the research along with the clinical experience of the researcher. After designing the instruments, other clinicians with significant experience in the field of chiropractic care for breastfeeding babies were consulted and no changes were recommended. Their review can be considered face validity. Face validity answers whether the content of the instrument appears to be suitable to its aims.¹² No further validity will be addressed as the questionnaires were deemed suitable for the population under study.

Justification for type of research

The use of questionnaires in clinical practice has increased significantly in recent years.¹³ They are considered an important aspect of patient-centered care, to access what the end user of health care is actually thinking. There was

no attempt to provide a survey that might be suitable for a broad range of clinical encounters, but only a presentation for the problem of suboptimal breastfeeding.

Sample selection and recruitment

The selection is by convenience sampling method. This means that all mothers and babies who make an appointment and attend the feeding clinic are open to recruitment. Mothers who attend clinics for the problem of breastfeeding can be considered a sensitive population of mothers with newborns and it is unknown how happy they may be to discuss their problems. Procedure questions that will be answered with this research is whether mothers are willing to participate in surveys, ease of recruitment and whether the surveys administered will be completed in their entirety. However, other research has shown that mothers are happy to provide information needed to help their newborn.¹⁴

Data collection

Each mother routinely attending the breastfeeding clinic signs a consent form for involvement into research upon entry to the clinic. If the mother agrees, then she will be met by reception staff who will then gain verbal consent from her to answer a few questions (i.e., the initial intake survey, Box 1). After answering the survey, the mother will be escorted to the feeding clinic for the clinical encounter. She will be asked whether she is willing to answer a short survey when the encounter has ended. If she replies yes, she will then be met by the same staff member who will escort her out of the clinic and administer the exit survey (Box 2). After the mother has left the clinic, the staff/clinician will collect the clinic form that contains the demographic and musculoskeletal profile of the child (Box 3) and collate all three forms and store them in a secure locked space for the researcher to process. All forms will contain only a number and no names for privacy and confidentiality.

Data analysis

The researcher will collect and collate the data and enter it into an Excel spreadsheet. This will allow the researcher to use descriptive data to describe the population that has presented and also will allow derivation of means, modes and medians (which can be useful with such a small population). There is one open-ended question asking the mother how she feels at the end of the session. These answers will be collected and developed into themes according to qualitative research methods.¹⁵

Data analysis will allow the researcher to learn whether the data has value and where it sits in the spectrum of this type of data that has been collected in other studies.¹⁶ The descriptive data will be represented in tables and graphs in order to depict it clearly.

Strengths and Limitations of the study

The main strength of this study is that it uses and values the perceptions of the health care user, the mother. A major limitation of the study may be that the mothers may answer in a way that they think that they should, instead of what they really feel. This is called social desirability bias and it may result in higher satisfaction scores since the surveys will be completed in the clinic. Another possible limitation is that the voluntary participation may bias the result in a positive way. Evidence suggests that non-responders tend to be less satisfied than responders. These concerns will be considered in the discussion.

Ethical considerations

There will be complete confidentiality in data collection. Mothers will sign a form to be included in research upon entering the clinic. She will give her verbal consent, as well, to be asked questions. In a clinical encounter, questions are a routine part of the clinical encounter and further ethical considerations are not usually required.¹⁷ All data will be held on a password protected computer. All hard copies will be destroyed once the study has been completed and published. There are no names included in any of the data collected. Complete anonymity of all data will be honored at all times.

Thank you for attending our Breastfeeding clinic. Please help us by answering the following questions:

1) Why have you come to this clinic today? (Tick as many as apply)

- ☐ Breastfeeding problems ☐ General health of the baby
☐ Someone told me to attend, who? _____
☐ Other

2) Who have you previously consulted about this problem? (Tick as many as apply)

- ☐ Health Visitor ☐ Midwife(s) (1, 2, 3) ☐ Hospital ☐ Lactation Consultant ☐ GP
☐ Paediatrician ☐ Peer Support ☐ Chiropractor ☐ Osteopath ☐ Other

3) Has this problem affected your ability to manage in any of the following ways? (Tick as many as apply)

- ☐ Feed your baby ☐ Work ☐ Attend to your family
☐ Rest ☐ Socialise ☐ Other

4) On a scale of 1 (no problem) to 10 (serious problem), how serious is the issue that brings you here today? Circle the correct level.

No Problem

1

2

3

4

5

6

7

8

9

10

Serious Problem

Date _____ Time _____ No. _____

☐ Research manager or assistance tick here if consent has been given

Box 1: Instrument 1. Survey to enter clinic.

Thank you for attending our Breastfeeding clinic. Please help us by answering the following questions:

1) On a scale of 1 (Totally dis-satisfied) to 10 (Very satisfied), what is your level of satisfaction with your clinic visit today? Circle the correct level.

Very dis-satisfied

1

2

3

4

5

6

7

8

9

10

Very satisfied

2) Do you feel that you can continue to breastfeed your baby? ☐ Yes ☐ No

3) In a word or two, what do you feel now? _____

Date _____ Time _____ No. _____

Box 2: Instrument 2. Survey at the close of the first visit.

Date _____ FILE NO. _____

Maternal perceptions of an Interprofessional breast feeding clinic: A service evaluation

Mother and infant demographic profile

Infant Age: _____ Gender: ☐ Female ☐ Male Gestational age: _____

Birth:

☐ Normal vaginal ☐ Planned C-section ☐ Induced ☐ Ventouse

☐ Forceps ☐ Emergency C-section ☐ Vaginal breech ☐ Other

Feeding:

How long did the mother exclusively breastfeed?

☐ Never ☐ 1-7 days ☐ 1-2 weeks ☐ 2-3 weeks ☐ 3-4 weeks ☐ 1 month or more ☐ Until now

When did parents notice feeding difficulties?

☐ Immediately ☐ 1st week ☐ 2nd week ☐ 3rd week

☐ 4th week ☐ 5th week ☐ 6th week ☐ Later

How is the baby fed?

☐ Exclusive breastmilk ☐ Combination breastmilk and formula ☐ Formula

Observed feeding problems:

☐ Attachment ☐ Clicking/noisy ☐ Nipple/breast pain ☐ Sleepy ☐ Nipple shields

☐ Mastitis ☐ Blocked ducts ☐ Thrush ☐ Unsettled ☐ Favours one side

☐ Bottle

Sleeping:

Does the baby sleep supine?

☐ Always ☐ Mostly ☐ Sometimes ☐ Never

MSK:

Does the baby have restrictions?

☐ Cx region ☐ Tx region ☐ Lx region ☐ Sx region ☐ Muscles of mastication

Does the baby have a positional preference?

☐ No ☐ Yes, left ☐ Yes, right ☐ Yes, extension ☐ Other

Does the baby have a positional head deformity (PHD)?

☐ No ☐ Yes, flat left ☐ Yes, flat right ☐ Yes, flat bilaterally ☐ Other

How was the baby treated in feeding clinic?

☐ Midwife care & chiropractic treatment ☐ Midwife care only ☐ Chiropractic treatment only

Box 3: Instrument 3.

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A risk too great? Stroke implications with manual therapy for the pregnant patient: A scoping review

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Purpose

Although chiropractic care typically includes the care of pregnant patients, the research literature on safety for this patient group is relatively sparse. Pregnancy and particularly the puerperium are associated with an increased risk for stroke.¹ Recent new evidence suggests less obvious risks for stroke, including the near-epidemic of obesity along with the Covid-19 pandemic. A systematic review of COVID-19 risks described how this infection activates coagulation pathways and thrombosis, with pregnancy possibly acting as a trigger increasing the risk for stroke.² The purpose of this scoping review is to update and address the potential stroke risks in an effort to improve safety and efficacy when treating this population. A scoping review is an overview of the current background evidence relevant for clinical practice.

Background

Spinal manipulative therapy for the pregnant and peripartum patient is common and addresses biomechanical complaints during this period of change.³ Early research showed that 31% of pregnant patients sought complementary care and that chiropractic care was the third most common type of care they chose.⁴

Care for the pregnant patient is not restricted to chiropractors who have special skills in this area, but there are those who specialize in pregnancy and pediatrics who more likely treat pregnant patients.⁵ Safe and responsible management of the pregnant and peripartum patient requires knowledge of the process of pregnancy and the associated risk factors. The effect of high force rotary maneuvers in the upper cervical spine on the vertebral artery and the possible risk for stroke is not clearly understood.⁶ Although severe adverse effects of spinal manipulative therapy in the cervical spine are rare,^{7,8,9} studies among antepartum and postpartum women are lacking. There are studies published recommending lower force techniques for children^{10,11} but, as of yet, no guidelines exist for pregnant patients at risk for stroke.

This report outlines specifically the risks for stroke in the pregnant patient. Maternal stroke is an acute ischemic or hemorrhagic cerebrovascular event which complicates pregnancy or the postpartum period. Pregnancy associated stroke has a three-fold higher risk compared to stroke in

young non-pregnant adults.¹² Stroke occurs most commonly in the third trimester, during delivery and six weeks postpartum.¹³

Stroke in the pregnant patient is rare. The rate varies from 21 to 201 events per 100,000 deliveries,^{7,8} with an average rate of 40 incidents per 100,000 deliveries.¹⁴

The incidence of stroke is increasing with a 50% increase during delivery and over 80% increase in the postpartum period measured during ten-year periods from the mid 90's to the mid 2000's.¹⁵ The mortality and morbidity are high and climbing, accounting for up to 13% of maternal deaths.^{1,16,17} All maternity care givers must be able to assess women experiencing stroke related symptoms. Stroke symptoms depend on the part of the brain affected by the insult. Weakness, numbness, vision and speech abnormalities can all occur.¹⁸

An increased risk for stroke is a contraindication for high force manipulation of the upper cervical spine. By identifying the factors that increase the risk for stroke, treatment can be more safely adapted while addressing common mechanical problems in these patients. Using manual therapies, we are clearly obliged to identify vulnerable patients with an increased risk for stroke and update our treatment techniques.¹⁹

The goal of this paper is to focus specifically on women with an increased risk for stroke, particularly the pregnant and peripartum woman, and make recommendations for care with manual therapy.

Methods

A search was performed on the primary search engines PubMed, and ResearchGate using the keywords, "pregnancy stroke" migraine; "stroke race" pregnancy; "stroke women" pregnancy; "hormones stroke" pregnancy; obesity "stroke pregnancy"; "manual therapy" stroke. Articles from the past 25 years were selected. Articles not in English were excluded as well as case reports, commentaries, pilot studies and letters to the editor. References from selected articles were hand searched. Seven hundred and seven articles were found. Fifty-two were found relevant and used for this investigation.

Results

Stroke affects women disproportionately and is one of the most common causes of death in women and a primary cause of disability.²⁰ Vascular risk factors occurring in both men and women are the primary cause of stroke.²¹ These risk factors include hypertension, hyperlipidemia, diabetes mellitus, smoking and atrial fibrillation.²¹

The risk for stroke in women is influenced by sex hormones, endogenous and exogenous estrogens, and hormonal changes due to pregnancy and changes during the transitional periods in life.²⁰ The timing of menarche influences the risk for stroke, particularly a very early and/or very late onset of menarche has been linked to an elevation in the risk for stroke.^{21,22} Women who have a shorter reproductive lifespan have a significantly increased risk for stroke and particularly those who experience a younger age of onset of menopause.²² The use of combined oral contraceptives (COC) among women has been associated with an increased risk for stroke (pooled relative risk 7 to 32-fold),^{22,23} compounding the risk when other cardiovascular risk factors are present. These are specifically: smoking (up to 19-fold), age younger than 20 or older than 35 (up to 5-fold), and migraine headache (4-8-fold).²⁴ When the use of COC, smoking and migraine with aura are combined, there is a 73% increased risk for stroke.²⁴

Pregnancy, the third trimester and the puerperium (6 weeks postpartum) particularly, are associated with an elevated risk for stroke with up to a 9 to 15-fold increase.^{26,27,28} Eclampsia and preeclampsia are the strongest risk factors contributing to stroke during pregnancy accounting for 25 - 57% of strokes and obesity elevates this risk 12-fold.³⁰ Compared to women with normal weight, the hazard ratio of ischemic stroke increased from 1.40 (95% (CI) 1.27-1.54) in obese women to 4.71 (95% CI 3.88-5.72) among women with severe obesity.³⁰

Women diagnosed with infection at the time of delivery have a 2.4 times -10.5 times risk of having a stroke regardless of their hypertensive status.³¹ Genitourinary tract infections occur in about 20% of pregnancies³² and increase the risk for preeclampsia 1.3-fold.³³ Box 1 lists more comprehensively the risk factors for stroke in the pregnant patient.

The condition not associated with pregnancy that has the greatest influence on the risk for stroke is a history of migraine headache (RR 16.9, 95% CI 9.7-29.5).³⁴ There is evidence that a history of any type of headache is associated with a 2.4-fold higher risk of developing preeclampsia (OR 2.4, 95% CI 1.7-3.3).³⁵ Migraine headache (MH) is an important risk factor for hypertensive and vascular diseases during pregnancy increasing the risk for stroke 2 to 9-fold.^{36,37,38} Twenty-four percent of women 30-39 years of age are estimated to suffer from migraine headaches.³⁹

Women with a history of migraine before pregnancy had a 3.5-fold higher risk of preeclampsia (95% CI 2.2-5.4), while if migraine persisted into pregnancy, the risk increased 4-fold (95% CI 1.9-8.2) as compared with women with normal blood pressure.³⁵ Both migraine and pregnancy are associated with hypercoagulability, compounding the risk for stroke. Migraine is an independent risk factor when presenting as a secondary headache significantly increasing the risk for gestational hypertension as well.⁴⁰ A migraine headache which worsens during pregnancy increases the risk for hypertension 13-fold³⁴ as well as the risk of developing preeclampsia.⁴⁰

Race and ethnicity both are associated with the incidence and severity of strokes. Non-Hispanic black, Hispanic and Asian pregnant women have a two-fold increased risk for stroke,²³ while Hispanics have greater risk of mortality following stroke.⁴¹ Pregnancy induced complications such as pregnancy induced hypertension, gestational diabetes mellitus and preeclampsia are associated with an increased long-term risk for stroke.⁴¹

Age > 35	(RR 2.0, 95% CI 1.4-2.7)
Afro-American ethnic origin	(RR 1.5, 95% CI 1.2-1.9)
Chronic Hypertension	(RR 6.1, 95% CI 4.5-8.1)
Heart disease	(RR 13.2, 95% CI 10.2-17)
Thrombophilia	(RR 16.0, 95% CI 9.4-27.2)
SLE	(RR 15.2, 95% CI 7.4-31.2)
Diabetes mellitus	(RR 2.5, 95% CI 1.3-4.6)
Smoking	(RR 1.9, 95% CI 1.2-2.8)
Thrombopenia	(RR 6.0, 95% CI 1.5-24.1)
Alcohol use	(RR 2.3, 95% CI 1.3-4.6)
Preeclampsia	(RR 4.4, 95% CI 3.6-5.4)
Postpartum infection	(RR 25.0, 95% CI 18.3-34)
Electrolyte imbalance	(RR 7.2, 95% CI 5.1-10.0)
Blood transfusion	(RR10.3, 95% CI 7.1-15.1)

Box 1. Identified risk factors for stroke and vascular disorders during pregnancy²⁷

Discussion

Safe and responsible management of the pregnant and peripartum patient requires knowledge of the process of pregnancy and the associated risk factors. The objective of this scoping report was to identify specific risk factors for stroke in the pregnant patient in order to increase safety and efficiency when treating this subgroup of patients. Headache during pregnancy is a very common presentation to the chiropractor. A typical patient is presented in Box 2 (next page).

Headache, first and foremost, is a hallmark risk for stroke because of its associated maladies. A thorough

understanding of the patient presenting with headache is imperative as it may signal the onset of preeclampsia and/or stroke. That said, the majority of headaches are benign and may be safely treated with appropriate techniques. Women with a history of primary headaches are more susceptible to acute arterial hypertension during pregnancy, particularly those whose headaches worsen during pregnancy.³⁴ Primary headaches otherwise usually improve or remit during pregnancy (60-80% improve).³⁴ A high frequency of attacks and the recent onset of migraine headache is related to an increased risk for stroke.⁴²

Secondary headaches commonly occur in pregnancy due to hypercoagulability, hormonal changes and anesthesia for labor.⁴³ Longer headache duration during pregnancy may herald the sign of a secondary headache.^{43,44} Clinically the most common cause of a secondary headache in the pregnant patient is a stroke.⁴⁵ Hypertensive disorders of pregnancy with preeclampsia are also a major cause of secondary headaches during pregnancy. Preeclampsia presents as a progressive bilateral (temporal, frontal, occipital or diffuse) pulsating headache which can be associated with visual changes similar to the typical visual aura of migraine. The

headache of preeclampsia is often aggravated by physical activity similar to a migraine headache. It fails, however, to respond to the over-the-counter remedies which may be the herald symptom of preeclampsia.⁴⁶ The African American race, obesity and nulliparity are all risk factors for preeclampsia.^{43,44} Preeclampsia affects 4% of pregnancies in the US and increases the risk for stroke 4-fold.⁴⁷ This risk is provoked by preexisting genitourinary tract infection, chronic hypertension, pro-thrombotic conditions and coagulation disorders.³⁶

Hypertension in pregnancy is common and is defined as a systolic blood pressure of at least 130mm Hg or diastolic blood pressure of at least 80mm Hg. In the US, approximately 25% of women of reproductive age have hypertension.⁴⁸ Of these, less than half are aware of their diagnosis and, when diagnosed, only 10% have their blood pressure controlled.⁴⁸ Further, racial differences exist; more than half of non-Hispanic black women aged 20-years or older are afflicted with hypertension.²⁰ Hypertension is an important risk factor for stroke and can easily be monitored in combination with the clinical visit. The history is specific for the pregnant patient and should provide vital details highlighting any important risk factors (Box 1). This illustrates the need for a special skill set when managing this patient group. Understanding the woman's hormonal history (including prior pregnancies), family history of clotting, her headache history, her history of cardiovascular health and relevant lifestyle factors will offer some clues when assessing the risk for stroke. Monitoring blood pressure at every visit is crucial as high blood pressure may herald the onset of preeclampsia.

A 26-year-old pregnant woman presented with a severe headache, duration 8 weeks. She had a history of anxiety, and migraine headaches with aura, and particularly when pregnant. She reported that in the 2 years since she was treated last with chiropractic care, she had not had many headaches at all. She presented 2 years ago pregnant with her second child complaining of severe headaches and jaw pain. She responded well to manual therapy using an instrument to address reduced mobility in the joints of the upper cervical spine while avoiding high force and rotary stress in this area. Her mother has migraine headaches and had a blood clot while pregnant. The patient describes a pulsating headache, tinnitus, and pressure in the head. She recognized this type of headache and had had it before. She did not want to follow recommendations of her GP to have a computer tomography due to her concerns for risk to the fetus. She wanted to be treated with manual therapy for the headache. Her blood pressure was 110/70. The clinical examination revealed kyphosis with forward head positioning and an open scissors posture between the pelvis and the torso. The neurological examination including cranial nerves, deep tendon reflexes, strength and sensation of facial muscles were all unremarkable. Lab tests were normal. The patient agreed to modified manual therapy to the cervical spine. The patient was treated with deep tissue therapy to the cervical paraspinal muscles, the muscles of the jaw and face. An activator instrument was used to address reduced mobility of the upper cervical spine with the head positioned in slight rotation and lateral flexion. She received acupuncture following manual therapy. The patient experienced relief after the first treatment. There were no adverse effects of treatment.

Box 2 delineates the history and management of a pregnant headache patient presenting to a chiropractor.

The recent trend of an increasing rate of stroke among pregnant women is likely attributed to older age in pregnancy, increasing rates of obesity,⁴⁹ smoking, diabetes and hypertension.^{49,50} A large study in Sweden from 1982 to 2014 showed a significant increase in the risk for early stroke in overweight young women, and a marked increase in obese women.³⁰ Overweight and obesity in pregnancy provoke a systemic inflammatory response which are thought to contribute to the development of preeclampsia.³⁰ As with other infections, it is likely that the Covid-19 infection activates a similar inflammatory pathway triggering an increased risk for clotting and subsequently stroke,² though the risk for acute respiratory distress and pneumonia is higher.⁵¹ The particular risks for the pregnant patient associated with COVID-19 may take many years to fully understand. The clinician must remember that symptom-free patients infected with COVID may present for treatment, highlighting the need for vigilance in assessing risk factors and adapting treatment.

It is not uncommon clinically to meet a pregnant patient handicapped with pelvic girdle pain resulting in immobility.

Decreased mobility increases the risk for clotting in these patients, compounding their other risk factors for stroke. When treating other areas than the cervical spine, it is important to advise against breath holding during treatment as it causes an overshoot in blood pressure and should be avoided.⁵² Though the headache that patients experience may not be classified as severe, as a clinician, all the risk factors must be evaluated when deciding appropriate management for the patient at hand. Those patients with an increased risk for stroke and particularly multiple risk factors should be managed with alternative treatment techniques avoiding high force manipulation to the upper cervical spine. These are listed in Box 3.

Conclusion

Although severe adverse effects of spinal manipulative therapy in the cervical spine are rare, studies among antepartum and postpartum woman are lacking. The treatment techniques chosen for the upper cervical spine in

the pregnant patient and women who have high risk for stroke should be carefully considered. An increased risk for stroke is a contraindication for high force manipulation of the upper cervical spine. The effect of high force rotary maneuvers in the upper cervical spine on the vertebral artery and the possible risk for stroke is not clearly understood. Therefore, alternative maneuvers should be considered particularly in this patient group who also have risk factors for stroke. For safe management of the high-risk pregnant patient, other techniques are recommended allowing for reduced force and more neutral positions of the upper cervical spine during treatment.

By identifying the factors that increase the risk for stroke, treatment can be more safely adapted while addressing common biomechanical problems in pregnant and peripartum patients, including neck pain and headache. A continuous update of skills and vigilance is required when dealing with vulnerable patient groups.

Activator instrument avoiding end range rotation of the upper cervical spine
Mobilization techniques modifying force and rotary components to the upper cervical spine
Deep tissue therapy addressing cervical paraspinal musculature
Stair step technique
Acupuncture

Box 3. Manual therapy techniques to reduce the risk for stroke.

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Do probiotics benefit new-borns and especially colic babies?

A clinical opinion of the evidence

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Purpose

Parents often present their infant for chiropractic care. In the therapeutic encounter there are often questions about the use of probiotics for their baby. There has been considerable research in the area of probiotics for infant colic. The goal of this opinion piece is to explore and interpret the research literature and help to clarify when probiotics may best serve the baby and mother.

Background

Chiropractic offices are receiving large numbers of infant patients into their practices, and an excessively crying baby, aka infant colic, is a very common presentation. Chiropractors have a well-known effective treatment for excessive crying,¹ but it may not solve the problem for every baby or parents may want a different approach. Consequently, and with the increased probiotic marketing in the last few years, parents frequently ask about it. Therefore, large numbers of parents are seeking professional information on the place of probiotics for their baby's health.

However, there is a lack of clear guidance on how to advise parents regarding probiotics for their infant. Despite many randomized controlled trials and several systematic reviews, it is not always recognized that research data must be translated for the practical applications to benefit the end user, the parent and infant. In short, evidence suggests that probiotics might offer some benefits,^{2,3} but don't tell you why and when to apply it. On the other hand, the latest Cochrane Review in 2019 reported that there is no evidence that probiotics are more effective for infant colic than placebo.⁴

When should a probiotic be taken?

So why should probiotics be given to the infant? Because mode of birth, mode of feeding and the environment make a difference to baby's microbiome. Infants rely on colonization of the gut in order to complete development of the immune system and gastrointestinal tract.⁵ Major microbial colonization of the human intestine is transmitted at birth (through the birth canal), as well as through skin to

skin contact and feeding in the first year of life and sets the stage for long-term health.⁶ Furthermore, researchers have found that one of the main sources of infant gut bacteria is the mother's gut,^{7,8} as they are directly transmitted by vaginal birth and breast feeding. In the mother, gut flora is transmitted to vaginal flora,⁹ which then is seeded to the newborn by passing through the vaginal canal at birth.⁷ Further studies have elucidated several modes of transmission (skin, oral, placental, vaginal, breastmilk) broadening our understanding of the development, maturation and stability of the fetal/infant microbiome.^{10,11,12}

This is especially important, because in vaginally born infants, maternal strains are found to be very stable over the first year of life. In contrast, non-maternal strains are unstable and less viable and nearly always replaced by the age of 12 months.¹³ This supports the hypothesis that the first inoculation of the infant's gastrointestinal tract with the mother's bacterial milieu is a significant introduction to bacteria and that the infant gut is seeded prior to birth with bacterial DNA. It is further supported as short chain fatty acids (SCFAs) (which play an important role in gut health and development) have been found in the amniotic fluid. It has been argued that this might be due to contamination.¹⁴ However, a study done by Stinson et al. (2019) retested this hypothesis by eliminating contamination as much as possible and still found bacterial DNA in the amniotic fluid.¹⁵ Since the fetus swallows amniotic fluid in the last two semesters of pregnancy, it supports the conclusion that the first colonization of the gut starts at this point. In fact, data from Stinson et al. indicated that the majority of bacterial DNA found in the fetal gut at birth is also found in the amniotic fluid.¹⁵ Furthermore, not only is the amniotic fluid microbiota similar to that in the fetal gut, but also to the placental microbiota.¹⁴

Even though this data shows that the fetus is exposed to bacterial DNA prior to birth, it does not prove that the DNA comes from viable bacteria.¹⁵ It might be the case that dead bacterial remnants have passed through the placenta into the amniotic fluid. Therefore, it is still unknown whether

the baby's microbiome development begins prenatally in utero or singularly, by passing through the birth canal. What is known is, that the infant microbiome is colonized no later than when going through the birth canal and that the vaginal flora is similar to the gut flora of the mother. Further, it is known that bacterial DNA by itself influences the fetal immune development,¹⁵ as well as sets the stage for fetal metabolism.¹⁶

An abundance of literature has become available in the last decade highlighting the importance of the microbiome. El Aidy et al (2016) reported that the gut microbiome plays a crucial role in host physiology. Disruption of its community structure and function can have wide-ranging effects making it critical to understand exactly how the interactive dialogue between the host and its microbiota is regulated to maintain homeostasis.¹⁷ Ringel-Kulka, et al (2013), then Cryan, et al (2019) described how the brain-gut axis allows bi-directional communication between the central and enteric nervous systems, linking emotional and cognitive centers of the brain with peripheral intestinal function.^{18,19} Recent experimental work suggests that the gut microbiota have an impact on the brain-gut axis.²⁰

Research supports that the microbiome influences metabolism, immunity, hormones and possibly even behavior.^{20,21} Among mammals, milk constituents directly influence the ecology of the infant's commensal microbiota. The immunological and nutritional impacts of breast milk and microbiota are increasingly well understood; less clear are the consequences for infant behavior. It has been hypothesized by Allen-Blevins, et al (2015), that infant behavior likely varies as a function of their mother's milk composition interacting with the infant's neurobiology directly and indirectly through the commensal gut bacteria.²²

Although the precise pathways of microbiota-hormonal signalling have not yet been deciphered, specific changes in hormone levels correlate with the presence of gut microbiota. The microbiota produces and secretes hormones, responds to host hormones and regulates expression levels of host hormones. The concept proposed by Clark, et al (2014) was, that the gut microbiota serves as a virtual endocrine organ, which arose from a number of important observations.²³ They cited animal studies that showed exaggerated responses to psychological stress, which normalized following colonization of the gut by *B. infantis*.²³ This discussion was expanded by Williams, et al in 2020.²⁴ Another study by Luoto, et al (2010) demonstrated that *L. rhamnosis* PL60 played a role in the reduction of body weight gain and white adipose tissue without any effects on food intake.²⁵ And lastly, a study showed that manipulating the microbial composition of the GI tract modulated plasma concentrations of tryptophan, an essential amino

acid and precursor to serotonin, a neurotransmitter that is known to improve mood and positive feelings.²⁶ Long term implications of the protective role in the function of many systems of the body that a healthy microbiome plays cannot be underestimated. The investigation of the microbial bioprotective role of probiotics at the intestinal level has been promoted by Garcia-Conzaes et al (2020).²⁷

The development of the functional human microbiome is also critical in the development of preventive protocols for one of the most devastating neurologic disabilities befalling children at an alarming rate (1:54 children according to the most recent CDC data available).²⁸ According to Doenya (2018), there is accumulating evidence, which has strengthened a link between dysbiotic gut microbiota and autism.²⁹ This recent evidence implicates immune system alterations and gut microbiotic dysbiosis and its potential effects on ASD (autism spectrum disorder), susceptible genes, neurodevelopment and intestinal and blood brain barrier integrity in at least some subpopulation of individuals with ASD.³⁰

Therefore, it cannot be emphasized enough that it is important for the mother to have a healthy gut microbiome before birth and it might be beneficial to start probiotic supplementation in the third trimester of pregnancy. To find out the need for supplementation exactly, a stool analysis should be done, although this is considered costly. Even without the stool sample findings showing imbalance, taking a pregnancy specific probiotic supplement can beneficially support a healthy floral array during pregnancy. It may prove to be a prudent recommendation especially since there is virtually no risk and there may be a powerful health benefit in the establishment of stable microbiota colonization for the infant.^{31,32}

The reproductive microbiome

It is customary to encourage mothers to take special care of themselves when they become pregnant. But what about her state of health before her pregnancy, let alone the state of her biological partner? In recent years the preconception and pregnancy microbiome has become the focus of several studies. Studies show that during the preconception period, the composition of the female as well as the male microbiome can interfere with reproduction as well as development of the fetus. Interestingly, the most prevalent microbiota detected in follicular fluid are *Lactobacillus* spp.³³ Additionally, they are associated with a better embryo quality and therefore leading to a significant higher rate of embryo transfer and successful implantation and gestation in women who undergo the complex series of procedures involved with in vitro fertilization.³³

Fetal viability, growth and development are largely dependent on optimal placental function, which includes

a healthy microbiome.³³ A different microbiome compared with normal pregnancy outcomes has been detected in placentas of pregnancies complicated by preterm birth.³⁴ It has also been found that the bacteria found in the preterm placenta were similar to those commonly residing in the vagina.³⁴ A vaginal microbiome composed solely of *Lactobacillus* before embryo transfer is associated with a successful outcome of IVF-embryonic transfer.³⁵ This suggests that the placental microbiome is influenced by the vaginal microbiome. Additionally, the placental microbiome has a taxonomic profile that is similar to the oral microbiome and longstanding periodontal disease may cause adverse pregnancy outcomes.³⁶ This suggests a full circle where colonizing bacteria may all have originated in the oral cavity which is, no doubt, influenced by what we put in our mouth. So, logic predicts that, when planning for pregnancy, taking an array of viable healthy oral and gut bacteria by mouth (powder or liquid would be preferable, as capsules open first at the upper intestinal tract) might be the recipe for success.

What about the male? It has been revealed that semen contains strictly facultative anaerobic bacteria of which the most abundant bacteria are *Lactobacillus*, *Pseudomonas*, *Gardnella*, *Finnegoldia*, *Corynebacterium* and *Staphylococcus*.³⁷ Interestingly, a positive association of a *Lactobacillus* dominated microbiome has been correlated with good semen quality due to the protective lactic acid synthesized by *Lactobacillus*.³⁷ Evidence shows that the seminal microbiome has a lower biomass, but a higher diversity compared to the vaginal microbiome and induces a significant change in the vaginal microbiome after intercourse.³⁸ So if the vaginal microbiome can be significantly changed by the seminal microbiome and since a healthy vaginal microbiome may be the deciding factor for implantation, it might be important for the male to take probiotics, especially when fertility problems arise.

The Cesarean-Section and the Formula-Fed baby

Infants born by Cesarean-section or those exposed to antibiotics (administered directly or indirectly through the mother) have been found to be at increased risk of developing metabolic, inflammatory and immunological diseases, which is thought to be due to disruption of normal gut microbiota.¹³ In a double blind, placebo-controlled randomized clinical trial, mothers were given a multispecies probiotic, consisting of *Bifidobacterium breve*, *Propionibacterium freudenreichii*, *Shermanii* JS, and *Lactobacillus rhamnosus*. Results indicated that it is possible to correct the changes due to antibiotic ingestion in microbiota composition.^{13,39,40} It is well known that antibiotic treatment alters the composition and metabolic function of the intestinal microbiota. These alterations may contribute to the pathogenesis of necrotizing enterocolitis and antibiotic-associated diarrhea, severe and life-

threatening illnesses of the neonate.⁴⁰ Their result suggests that correcting a potential health issue with a non-invasive and harmless procedure like the application of scientifically tested probiotic bacteria might be worth doing for both the baby born by C-section and the one receiving antibiotics.

The microbiome in the Cesarean delivered infants has been shown to be mostly devoid of the maternally transmitted seeding classes Actinobacteria and Bacteroidia during the first months of life; species of Bacteroidia in particular were consistently missing.¹³ The likelihood of transmitting maternal strains with vaginal birth is 0.87 compared to neonates born by Cesarean, which is 0.13. In addition to the absence of maternal strains, the Cesarean-delivered infants showed higher strain fluctuations than the vaginally born ones, particularly regarding Bacteroidia strains.¹³ Therefore, an unstable microbiome that is easily invaded by pathogens can also be easily supplemented by probiotics (good bacteria). Supplementing with Bacteroidia would be the solution to counteract the missing bacterial strain in Cesarean born infants. Just one obstacle arises; Bacteroides are an absolute anaerobic bacteria and are currently not for sale on the market. However, pre-clinical trials indicate that Bacteroides genus is widely considered as a source of novel beneficial candidates for attenuating inflammation by regulating lymphocytes and cytokine expression, controlling metabolism and preventing cancer.⁴¹ Therefore, they are in the development stage as a next generation probiotic (NGP).⁴² Until a NGP is available, supplementing with Bifidobacteria (phylum Actinobacteria) is a viable choice, not least because Bifidobacteria comprises the largest group within a healthy infant microbiome.⁵

Maternal breast milk contains live, culturable bacteria including Bifidobacteria,⁶ which are transported from the mother's gut by the enteromammary pathway to the mammary glands. The enteromammary pathway involves immune cell-mediated bacterial translocation from the mother's gastrointestinal tract into the mammary gland, where some of these bacteria are able to colonize the available niche in the baby's gut.⁴³ Even if the young intestine proved relatively unpopulated, vaginal birth, skin to skin contact, breast, even siblings, pets⁴⁴ and the environment⁴⁵ further populate it with a diversity of healthy bacteria.^{44,45} As the baby gets older, the bacteria increase in number and colonize more of the surface area of the gut. If this natural process is interfered with, opportunistic organisms (pathological bacteria, yeast, parasites) are presented with the opportunity to populate the gut. It then becomes a matter of the infant's healthy microbiome to suppress the colonizing invaders to counteract disease. This could prove a hard fight to win. Fortunately, human milk is another avenue of stimulation of the further proliferation of mainly Bifidobacterium and numerous *Lactobacillus* strains. Bifidobacteria, the predominant probiotic microorganisms

present in the maternal and infant gut, creates an acidic environment, rich in short chain fatty acids (SCFAs) with a protective and nutritive role for the neonate's intestines,^{46,47} and therefore supports the baby's immune system.^{13,47} Subsequently, the lowering of the pH creates an ideal environment for the "good" bacteria to function, which then leads to the inhibition of inflammation, pathogens and creates an environment to naturally avert any invasion of 'bad' bacteria.^{48,49,50} Furthermore, the microbiome composition of the neonate is influenced by the gestational age at birth (preterm vs term), by birth mode (vaginal vs c-section), by diet and feeding method (breast vs bottle (pumped breastmilk vs formula) and later solid food)⁴⁹ and environment (Hygiene Hypotheses).^{44,45} The gut colonization continues with a shift to a solid food diet, which contains a lot of plant polysaccharides. Clostridia (phylum Firmicutes) are introduced in addition to the species Actinobacteria and Bacteroidia which are derived directly from the mother by vaginal birth.¹³

Table 1 shows predominant bacterial strains in the gut delineated by birth mode, feeding mode or environment.

Research has shown that a suboptimal microbiome can be changed towards a more preferable one. In recent years, the implementation of formula with added prebiotics and probiotics has been shown to modulate the microbiome composition towards that of a breast-fed infant gut flora and to stimulate the immune response.⁵¹ Two things should be noted. Most of these studies were done by special interest groups, such as formula companies. Secondly, it is well-known that probiotic bacteria cannot survive in temperatures above 40° Celsius (104° Fahrenheit). Most

mothers prepare bottles with boiling water, far above those temperatures.

Does probiotic supplementation help with infant colic?

Table 2 (following page) shows evidence that probiotics may be helpful for infant colic in breastfed babies. The question must be asked: Why do probiotics only help infant colic in breastfed babies and not in formula fed babies? Why does the Intervention with *L. reuteri*, for example, only have a significant effect on babies being breast fed? This suggests that maybe it was the composition and beneficial bacteria of breast milk helping *L. reuteri* to proliferate and not vice versa.

If the normal development of the microbiome is interrupted due to circumstances that arise during gestation, birth and early postpartum, infants may require support to populate the gut with bifidobacteria along with lactobacillus in order to maintain the pH necessary to avoid overgrowth of pathogens. This will help normalize immune function and decrease inflammation which may reduce the infant's discomfort. Viable Bifidobacteria are found in breast milk.⁵² The question remains: if we supplement with an additional probiotic (*L.reuteri*), is there a "critical mass" of these two probiotic bacteria that when it is reached, the effect is to calm the irritable infant or is it because there is already a lower incidence of colic in breastfed babies, and these mild cases would resolve on their own?

Prebiotics such as human milk oligosaccharides (HMOs) are a group of important complex carbohydrates that are found in breast milk. These HMOs are important in the developing infant because they help to shape the infant's

1. Pregnancy	- Term: - Preterm:	Decrease Faecalibacterium/ Increase Proteobacteria, Actinobacteria Decrease Bifidobacteria
2. Birth mode:	- Vaginal - C-Section:	Lactobacillus, Prevotella, Bacteroidales, Actinomycetales Increased pathogenic Microbes (ex. Staphylococcus, Clostridium)/Decreased Bacteroides, Bifidobacterium
3. Feeding mode:	- Breast milk: - Formula fed: - Solid food:	Decreased Firmicutes/ Increased Bifidobacteria (<i>B. Infantis</i>), Lactobacillus, <i>L. rhamnosus</i> Veillonella (18.4%) and Escherichia/Shigella (15.2%) Decreased Bifidobacteria/Increased Enterococci, Enterobacteria Streptococcus (18.64%) and Klebsiella (17.41%) Bacteroidetes increase for the digestion of insoluble fibers
4. Diet :	- Europe: - Africa:	Decreased Bacteroidetes/ Increased Firmicutes (Clostridia, Enterococcus) Decreased Firmicutes/ Increased Bacteroidetes
5. Environment:	- Hygiene	Hypotheses, where the child for example is not exposed to unhygienic circumstances and a decrease in diversity of commensal microbes results.
Most important time period for colonization is from birth to one year of age. In C-Section, this is delayed. After the third year of age the microbiome stabilizes.		

Table 1: Predominant bacterial strains by birth mode, feeding mode or environment (most common strain in bold)^{22,25,45-49,56,57}

gut microbiome by facilitating the selection of beneficial bacteria,⁵⁰ and therefore, improve the balance and function of the microbiome. Could it perhaps take more time in some vulnerable infants to reach the protective levels in the microbiome? If so, might a longer time of intervention with probiotics be required?

Colostrum, which is the first milk produced, contains the prebiotic HMOs, which promotes in vitro growth of gut bacteria like *Bifidobacterium longum* subspecies *infantis*, while suppressing growth of pathogens like *Escherichia coli* and *Clostridium perfringens*.⁵ No one has studied whether the colic babies who were breastfed may have missed out on early colostrum due to difficulty with feeding in the first place (but later overcome). There are many confounding factors that must be examined before merely accepting the studies' findings without question. Another factor that is not controlled for in the studies is the type of birth, which, of course, is an absolute key to the health of the microbiome. The confluence of natural vaginal birth with breastfeeding optimizes the normal microbiome. Vaginally born infants receive the advantage of being colonized with *Lactobacillus*, especially *L. bifidus*.^{11,36} These have been found in preponderance in stools of breast-fed infants and this creates an ideal environment for the "good" bacteria to develop and grow, which in turn improves the health of the infant. Another question would be: are the colicky infants in those studies more likely to have had a mechanized birth, since it is known that assisted birth is the major risk factor for colic?²⁵³ That alone would explain why only some breastfed babies have colic and why a probiotic might be helpful. In the opinion of the authors, more research is indicated in this area, controlling for confounding factors.

Which baby should take probiotics?

Perhaps such a simple concept, as administering probiotics to an infant is not quite so simple. Confusion is created by studies using different probiotics (mono-and multispecies,

powder and capsules, different species, etc.), measuring systems, research approaches and finding variable results. This may make interpretations convoluted and difficult to follow as well as to know which probiotic to apply for which condition. Without additional knowledge about single strain development and their specific benefits in human health, probiotics in the general population are being treated as if they are all the same without taking their singularity nor interactions into consideration.

For example, two probiotic bacteria that have been shown to benefit a specific health condition, might not interact beneficially with each other if mixed together in one supplement. One probiotic supplement does not equal another. If one species demonstrated a beneficial result, another species might not when administered for the same disorder. It is even possible that when multiple species are combined in one supplement, they could potentially counteract each other's benefits. Research and discernment are required when preparing probiotic supplements. The spectrum design needs to be suitable for the pregnant woman, and the baby, respectively. Further, the probiotic must be approved by the FDA to be certain that the probiotic bacteria cannot translocate antibiotic resistance and has not been genetically altered.⁵⁴

Research has found that dysbiosis (defined as imbalanced gut microbiota) is present in some full-term babies diagnosed with colic.^{43,55} Does this automatically mean that supplementation with probiotics is the cure? Over recent years, criticism of the undefined use of the 'dysbiosis' term has been repetitively articulated. For example, there are many confounding factors, such as the maturation of the gut microbiota, the type of delivery, the type of feeding as well as prior antibiotic use.⁴⁰ Table 3 (following page) shows the main constituents of a dysbiotic microbiome.

A detailed history of the mother and baby needs to be

Intervention, N, Time	Result
<i>L. reuteri</i> (345 infants, 21-28 days) ^{2,3}	The probiotic group averaged less crying and/or fussing time than the placebo group at all times. The duration of crying in breast fed infants at the end of the intervention was reduced by almost 50 minutes, but only for exclusively breastfed infants.
<i>L. rhamnosus</i> (30 infants, 28 days) ^{2,3}	No significant effect was found. Breast- and formula-fed infants were included.
<i>L. casei</i> , <i>L. rhamnosus</i> , <i>S.thermophilus</i> , <i>B. breve</i> , <i>L. acidopilus</i> , <i>B. infantis</i> , <i>L. bulgari-cus</i> (50 infants, 30 days) ^{2,3}	The probiotic group averaged less crying than the placebo group at the end of the intervention. The duration of daily crying time was reduced by at least 50%. The study was only done on breast fed infants.
<i>B. animalis</i> subsp. <i>lactis</i> (80 infants, starting at less than 7 weeks of age for 28 days) ⁵⁸	A reduction of ≥50% of mean daily crying duration after 28 days of intervention. The mean number of daily crying episodes was also lower in the probiotic group than in the placebo. Studied on only exclusively breastfed infants.

Table 2: Effects of two mono- and one multispecies probiotic supplement to treat infant colic.

taken. That history must include these diverse factors to get a better understanding of the origin of any excessive crying. A neonate of a mother with a healthy diet, no known genetic or predisposing health problems, like allergies or neurodermatitis, vaginal birth and breast fed might

not profit significantly from probiotic supplementation. Additionally, a mechanical problem might be the cause of excessive crying and chiropractic care might be appropriate for a trial of treatment.

Conclusion

The microbiome health of a new-born baby depends largely on the mother's health, a natural vaginal birth and breastfeeding. When one or all of these are not present, supplementation with probiotics may be an appropriate answer. We hope to make the clinician aware of the research literature, how it is interpreted and when to take a complete history to determine which babies may benefit most from supplemental probiotics. In the case of supplementation, some gut bacteria are more beneficial for pregnant women and their offspring. In general, the most beneficial ones for the neonate and colic babies appear to be Bifidobacteria (especially when not breastfed) and Lactobacillus (especially when born by Cesarean). Further research on this subject is warranted.

1. Abnormal microbial exposure. Mother eating unhealthy, mother being unhealthy, parents with genetic or predisposed health issues, C-Section, bottle fed
2. Disruption in diet, (a) infant is formula fed; (b)breastfeeding only a short time such as a few weeks, (c) less than one year of breast feeding.
3. Medication usage, like antibiotics.
4. Host genetics, meaning a parent having allergies, atopic skin disease, asthma, diabetes, etc.

Table 3. Four main pathways to dysbiosis in the infant^{43,55}

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Families and babies: An ergonomic and postural guide during the COVID -19 Pandemic

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ABSTRACT

This article was created to help clinicians better communicate with new parents and family members on everyday posture and ergonomic advice when looking after young children. This information is particularly useful in the current COVID-19 pandemic as the lockdown situation can exacerbate previous injuries or result in new musculoskeletal complaints. Additionally, this article aims to provide useful websites and links for additional information to help parents purchase appropriate furniture for their children based on EU safety law and recommendations.

Key words: Ergonomic, Pediatric, EU law and regulations, safely and spinal hygiene

Introduction

During the COVID-19 pandemic and lockdown, a sizable portion of the population struggled with both mental and physical aspects of the isolation. Looking after young children has been a challenge for many parents who are also attempting to perform their employment responsibilities online at home (another challenge requiring their attention as for some it is requiring new technological education). This manuscript is designed to present essential information for practitioners to share with parents concerning posture, ergonomics and the importance of promoting their child's proper skeletal and neurological maturation. Sharing information in this format, given that attending medical appointments in person is more of a challenge these days, may help to enrich the telehealth experience between clinician and patient families.

Ergonomic advice could help optimize safety for both parent and child, improve parent spinal function, maximize efficiency of daily activities and reduce pain or discomfort. The three broad categories of postural ergonomic advice can be categorized as standing, seated and lying down. The goal is to promote safe and transferable movement pattern skills, for all members of the family and caregivers. Hip hinge, squat and forward lunge are some of the commonly used movement patterns that would help achieve a correct spinal alignment while handling young children and their equipment and furniture (highchairs, car seats etc.).

The ability to maintain the center of gravity is important. Posture is controlled through the sensory motor system. Our posture is the total output of all sensory (proprioception, visual and vestibular input) and motor input.¹ Demonstrating a posture examination either using

a posturography machine in the clinic, a plumb line or even a side view picture standing at home with and without holding their child, can help parents appreciate where they bear their weight during each task. Correlating the findings of postural examination and presenting complaints can explain if aches and discomforts experienced are directly linked to posture.²

As indicated in the picture below, a number of caregivers push the hips forward to stabilize their position and increase the lumbar lordosis significantly. This creates a posterior overall center of gravity, which can be linked with irritation in the hips and lower back.



Picture 1: Mother is demonstrating good and poor habits with posture when holding her child.

Immediate tips and changes that can be implemented include lifting the crown of the head, tucking the chin back slightly, dropping the shoulders, and slightly widening the stance.

Another simple and effective test is the standing balance test known as the Modified Clinical Test of Sensory Interaction in Balance (CTSIB-M).³ It is a very useful test that can be modified during an in-office or telehealth visit which challenges the three main sensory categories (proprioception, vision and vestibular function) that contribute to balance.

The test would normally be used and interpreted by the chiropractor in the clinic. However, if this is not possible because you are conducting a telehealth visit, balance may be evaluated with eyes open and with eyes closed. Closing one's eyes reduces the visual input into the system and the person is more reliant on the use of vestibular and proprioceptive input. This is a simple test that can be done safely at home by counseling the patient to perform the test standing clear of furniture, stair wells or sharp objects and preferably have another person to observe or support them if they sway or have difficulty balancing when performing each step of the test. This test provides some insight into the integrity of each of the sensory systems that supports balance and can provide information to the clinician to help devise remedial exercises or recommend further diagnostic testing, in clinic.

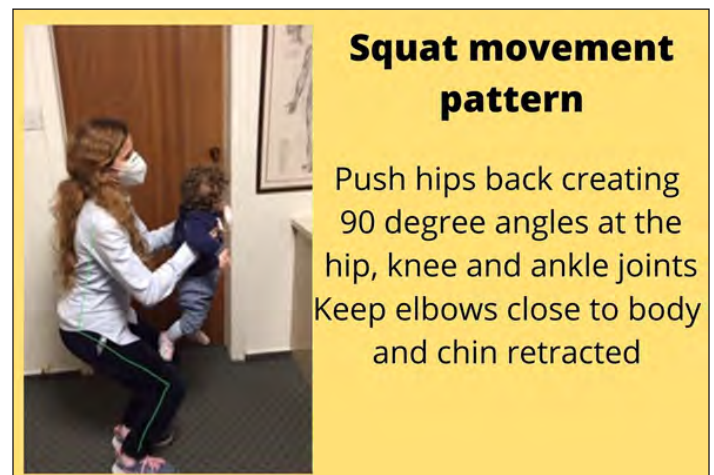
Sleeping and lying down: position safety and ergonomic advice

In the early 90's the introduction of 'Back to Sleep' campaign was instituted to reduce infant mortality due to the sudden infant death syndrome (SIDS).⁴ Shortly thereafter, the 'tummy time' campaign was introduced in response to developmental concerns about sole supine positioning of infants.⁵ The softness of the skull and bones is evident in early life as both membranous and cartilaginous bone are still undergoing secondary ossification.⁶ Alternating between sleeping on their back (supine) and tummy time ensures an even distribution of forces on the child's cranium. Hence, it is important that parents are encouraged to use supervised tummy time as early as possible after birth.⁷ Providing them with links to appropriate online information is a potentially effective way of sharing information with the family, especially during the lockdown.

According to the European Foundation for the care of the newborn, parents are advised to place children on their back to sleep, on a firm, flat, waterproof mattress with no pillows or toys. Additionally, parents are advised to protect bedding from covering face, mouth, and nose.⁵ Encouraging tummy time and playtime on the floor ensures that the child has ample opportunity to recruit the appropriate

musculature to work against gravity to create the lordotic spinal curves in the cervical and lumbar region. This also allows the child to utilize, express, and later integrate their primitive reflexes which is necessary for functional motor milestone attainment.

The guidelines from the European standards⁸ for the care of the newborn can be used to guide parents when selecting crib mattresses and bolsters/bedding, as well as ensuring there are no gaps larger than two fingers between the sides of the crib and the mattress to avoid accidents. Once the baby is able to sit up by him/herself, it is advised to move the baby mattress to a lower position. Furthermore, when the child reaches the side rail up to the level of the nipples, he/she has outgrown the crib and can now sleep in a bed.⁹ Ergonomically, parents can employ the hip hinge mechanism and spinal roll positioning when lowering the child into the crib and returning to an upright position. Correct use of a squat pattern can help the caregiver protect their back. And in addition, equally distributing the weight provides a safer more stable way of lifting a child.



Picture 2: Mother performing a squat with her child.

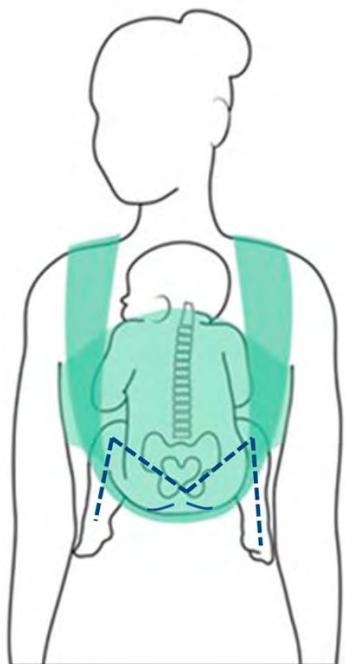
Employing the same safety information is essential when choosing a pram or stroller. A flat, firm reclining interior must be considered to ensure the safety of the child while sleeping. Especially during this pandemic, when visiting a store in person to "try it on for size" for comfort is less feasible, attention to the details of ergonomics and height is critical. It is essential that clinicians direct parents to safety guidelines and ergonomic advice to help them choose the best possible pram that would suit both them and the child. Some simple questions that would help the decision making are: what is the purpose of this pram? Small walks or daily long commutes? Consider the type of wheels and suspension. Will both partners be using this pram? If both, adaptable handles are a good idea so that it helps them maintain a better posture. If one partner has

lower back issues perhaps consider a hand-brake instead of a foot-brake. How much space is required for storage or portability and what weight do you want the pram to be?

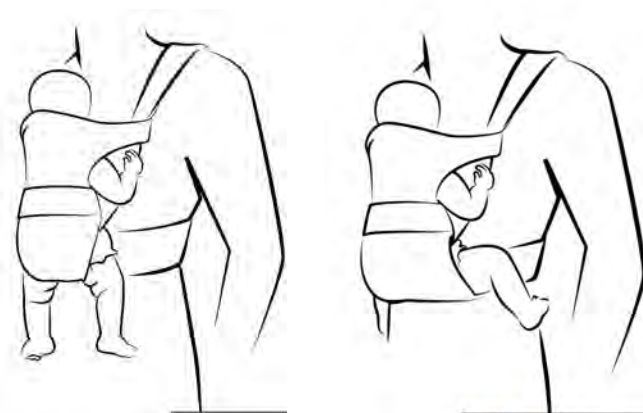
Considering all these points prior to making a purchase is important as these features will have an impact on the musculoskeletal system of both parent and child. The EU law specific for prams is the EN 1888—1:2018.¹⁰ It provides specific requirements for height and weight of children as well as safety criteria on material and design.¹⁰ Clinicians can encourage parents to have a closer look at the manufacturer's requirements for safety and be familiar with the applicable laws. It is also helpful to have contact information for any professional or community service organizations (like the local law enforcement center) that may provide complementary guidance or installation of equipment in motor vehicles.

Holding and babywearing

Babywearing to transport children has been utilized for centuries and in many civilizations dating back to when humans lived in tribes and foraged and moved constantly to find safe haven. Now, with a modern twist, it has become popular again. This practice has both positive and negative aspects to consider. Positives are that it allows a close bond between the family member and the infant, activation of the vestibular system though constant movement and change

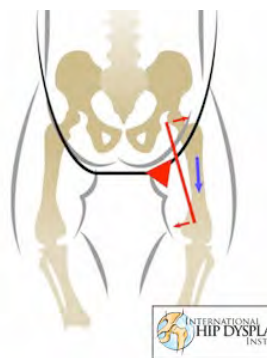


Recommended: Thighs spread around the mother's torso and the hips bent so the knees are slightly higher than the buttocks with the thighs supported. Illustration courtesy of the International Hip dysplasia Institute (IHD) from the Baby Carriers & Other Equipment Hip-Healthy Products, [click here](#) to see full statement online.



Not Recommended for prolonged use during babywearing (narrow based carrier).

Better.



Thigh NOT supported to the knee joint. The resulting forces on the hip joint may be inappropriate for prolonged use when infants have loose hip joints or hip dysplasia.



Thigh is supported to the knee joint. The forces on the hip joint are minimal because the legs are spread, supported, and the hip is in a more stable position.

Illustrations courtesy of the International Hip dysplasia Institute (IHD) from the Baby Carriers & Other Equipment Hip-Healthy Products, [click here](#) to see full statement online.

of directions, as well as early socialization.¹¹ However, given that the pelvis and long bones are not skeletally mature and still undergoing ossification, both parents and clinicians need to be attentive to the positioning of the child in the baby carrier. The position should at no time create traction of any articulation and limits should be set on the length of time that infants spend in it if sufficient range of motion is not achievable.

According to the International Hip Dysplasia Organization, hip dysplasia is the most common deformity in new-born as it can affect 6 in 10 infants.¹² It is important that when using a baby wearing device or carrying your child, their

hips are spread and the imaginary letter 'M' is maintained at all times. This ensures a better alignment of the bones where both the hips and knee joints are flexed. Their website has helpful advice and illustrations that can be downloaded to be distributed to parents.

Giving advice to parents about their "wearing posture" would be advantageous as well. They should be instructed to always strap on the carrier when seated and adjust the straps to support their own bodies as well as the child's. According to UK Sling Consortium¹⁰ the five important points for safety seen in Table 1 are:

1. The tension in the support straps of slings and carriers should be tight enough to prevent the child from slumping which can hinder their breathing and hurt the adult's back.
2. Always keep the child in view, face uncovered, at all times and,
3. Keep them close enough for the adult to tip their head down and kiss the top of the child's head or forehead.
4. A child should never be curled so their chin is forced onto their chest as this can restrict their breathing and,
5. Adjust the carrier or sling so that the child's back is well-supported and their stomach and chest are against the adult's chest and to prevent slumping and maintain airway patency.¹⁰

Acronym	Explanation
T	Tight support straps
I	Child in view at all times
C	Close enough to kiss
K	Keep chin off chest
S	Child's back is well supported

Table 1: TICKS used with permission of the UK Sling Consortium¹³

Ergonomic and safety tips for a child in a car

According to the EU law all children must travel in a child seat, booster seat or booster cushion' up to the age of 12.¹⁴ All children under 150cms or weighing less than 36kg must be restrained appropriately in a moving vehicle. The safest seat for a car seat is the back seat of the car in a rear facing direction, particularly for children up to the age of three. In a passenger seat with an active airbag, rear-facing child restraints must not be used. However, in an emergency, if a baby is transferred in the front passenger seat in a rear direction then the airbag on that side must be deactivated, while keeping all other mechanisms in place.

Positioning of the child in the car seat is important for safety and comfort. It is important to remove excess layers of clothing so that the straps fit well in the shoulders of the child. Hips preferably should not be pushed in adduction but rather maintain the — 'M' Shape (Flexion at the hip

Baby Slings

Not Recommended for prolonged use (cradle position holds the thighs together):



Better:



Illustrations courtesy of the International Hip dysplasia Institute (IHD) from the Baby Carriers & Other Equipment Hip-Healthy Products, [click here](#) to see full statement online.

and knees joints). Parents should be aware of their own positioning when transferring the child in and out of the car seat. They can use a squat to lift the child and hip hinge to place in the car seat. The new car seat comes fitted with a swivel mechanism, which facilitates parents using a hip hinge mechanism to place the child in the car seat. This helps safeguard the integrity of the parent's musculoskeletal system.

Highchair safety and ergonomic information

Highchairs are another piece of furniture that most families will inherit or purchase. It allows the child to sit at the level of the table, observe family members and improve their social and motoric milestones. However, it is essential that the design of this is steady with a large frame, a footrest for the child and an appropriate restraining system as high chairs provide one of the leading causes of accidents in homes. According to the EU Injury Database (IDB)¹⁵ data indicate annually approximately 7,700 injuries to children 0-4 years in the EU 28 Member States. The most current law for safety of highchairs in the EU is standard EN 14988:2017(EU14988, 2020).¹⁶ It is advised that parents are given this link¹⁴ for further information prior to making a purchase, as with the imposed lockdown is less likely that parents will be able to visit a store.

Safety and ergonomics of secondhand furniture

Family and friends often help new parents by gifting used furniture. It is important that some fundamental safety questions are answered prior to accepting and using a gift. For example, in the case of a car seat, parents can specifically ask if the car seat has ever been involved

in a motor vehicle accident? And in the case of any baby equipment or furniture, parents can ask if the previous owners were made aware of any recall on the product? Parents can use the information on existing labels to contact the manufacturer and ask if there have been issues reported on that specific product. Check for physical damage on the fabric of the straps, buckles, seat fabric damage or rusting on metal parts. If it's older than seven years, usually new technology has been released and is much better and safer.

Parents are reminded to follow all appropriate sanitation protocols especially during the current COVID-19 pandemic, (washing hands regularly and thoroughly cleaning regularly used surfaces).¹ Based on the recommendations from Centers for Disease Control and Prevention (CDC), Environmental Protection Agency (EPA)-registered surface disinfectant can be utilized safely to clean children's toys and furniture. If bleach is the preferred choice it must be between 5.25%—8.25% sodium hypochlorite. However, parents are cautioned both by manufacturers and CDC that seatbelts and car seats must not be disinfected as the chemical may irritate the safety features, however warm water and soap can be safely utilized.¹⁸

Conclusion

In summary, it is paramount that primary clinicians such as chiropractors maintain a good level of communication with the community, especially with new parents or caregivers of young children. It is essential to remind family members of the simple and yet effective way of ergonomically implementing these postural changes and empower them to carry on the essential work of looking after their youngsters and keeping them safe.

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A clinician's guide to pediatric oral motor development

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ABSTRACT

Purpose: Collaboration between healthcare disciplines is the foundation of a wholistic approach to a child's optimal health. For example, chiropractors have linked temporomandibular joint dysfunction to postural strain. Forward head carriage and associated changes in the anterior to posterior curves of the spine can result in an alteration in muscle length and function shifting stress to the face and jaw resulting in headaches or facial pain. This is one of the reasons pediatric chiropractors emphasize development of postural stability and closely monitor development and attainment of motor milestones. The authors of this paper propose that the effect of oral motor function may directly influence posture and as a result, should also be taken into consideration when working with the pediatric patient. In clinical practice with infants and children, it is imperative that pediatric health care professionals are aware of the developmental milestones children should be meeting so that they are able to support and guide families to navigate what is "normal" when assessing and understanding their child's growth and development. This is especially important as it relates to oral development. This paper will attempt to provide practitioners some assistance and resources for parents of children with oral motor dysfunction with an emphasis on appropriate and timely collaborative referrals.

Key words: oral motor function, breastfeeding dysfunction, feeding disorder, pediatric, developmental milestones, chiropractic, oromyofunctional therapy

Background

In clinical practice with infants and children, it is important that pediatric health care professionals are aware of the developmental milestones children should be meeting so that they are more able to help families navigate what is "normal" when assessing and understanding their child's growth and development. It is also important, based on the failure to meet these developmental milestones, to make appropriate and timely collaborative referrals to other health care professionals.

This is crucial when it pertains to oral motor development. Many patients with tethered oral tissues or TOT's (restrictive tongue, lip or buccal fascial attachments) are having them "released" surgically (by scissor or laser) at an early age to promote feeding and oral development.¹ This is a significant intervention that has the potential to benefit the child in numerous ways ranging from feeding to speech. However, there is a significant trend towards intervening with surgery without the recognition that there can be neurologic, biomechanical and motoric reasons for feeding dysfunction or lack of oral development that should be

differentially diagnosed as a potential cause or comorbidity.

Children grow and develop rapidly. Neuroplasticity is the malleability of the brain that allows children to integrate these rapid changes. When anything challenges the maturation of their nervous system or interferes with the development of critical skills (like breathing or feeding), it can result in a compensatory strategy.² Compensation, by its very nature, alters the child's proprioceptive experience and as a result, changes the way children move their bodies which could ultimately impede further developmental milestone attainment. An adaptive posture is often one of the first signs of compensation seen by a chiropractor once the child becomes weightbearing.

An important diagnostic step, as well as a collaborative adjunct to this surgical release (which is often performed within, but not limited to, the first weeks to months of life) is a functional assessment. Biomechanical function, including the identification of neural deficit, postural faults, subluxation, restriction or muscular asymmetry, would be best addressed by the chiropractor,³ while a

functional assessment of the oral motor development would be performed by an IBCLC (International Board Certified Consultant),⁴ oromyofunctional therapist (or oromyologist)⁵ an occupational therapist⁶ or a speech and language pathologist.⁷ Based on these assessments, the appropriate education can be provided to caregivers concerning the child's compensations and how to recognize when the child's motor planning and aberrant function is compensatory instead of normal, efficient and developmentally appropriate movement. These assessments assure the best outcomes whether that be the outcome of an adjustment, an exercise program or surgery and its concomitant habilitation of the musculature.

Orofacial Myology is the study of typical and atypical patterns of oral motor development. The aim of treatment is to develop and normalize oral motor movement patterns and strengthen oral motor musculature. There are many factors that can contribute to poor oral motor development like hyper or hypotonia, altered ranges of motion and compensatory patterns of movement utilizing recruited muscles or altered postures. Orofacial Myology focuses on giving the right neural input to muscles in order to accomplish a nasal breathing pattern, good lip seal, appropriate tongue rest posture, ideal jaw movement and grading and increased oral motor strength.⁸

Many different factors can contribute to atypical oral motor patterns as outlined in Table 1.^{9,10,11,12,13} The purpose of this paper is not to highlight the aforementioned pathologies but to help practitioners differentiate when common dysfunctional oral motor patterns are compensatory or to recognize abnormal movement or other significant red flags that would indicate an immediate referral to a specialized health care provider. This referral may refine the diagnosis and provide further support with a therapeutic intervention such as those offered by a medical providers (like an ENT, pediatric surgeon or dentist or orthodontist) or an IBCLC (when breastfeeding is involved), a chiropractor, orofacial myologist, physical, occupational or speech therapist, when theirs would be the appropriate interventive protocol.^{13,14}

- Airway obstruction
- Cleft palate
- Tethered oral tissues (TOTS)
- Hypertonia or hypotonia
- Poor motor planning or delayed motor development
- Cerebral palsy or other neurologic disorder
- Biomechanical dysfunction, cranial faults or restricted range of motion
- Assymetry in muscular development (example: torticollis)

Table 1: Factors that can attribute to atypical oral motor patterns.

The goal is to help children continue to develop typical oral motor strength and function during growth phases. As children grow and develop, their oral motor skills will become more refined. Along the way they may encounter challenges which can be remedied through remedial exercise, positioning or adjunctive therapeutics.

The aim of this paper is to help practitioners learn the signs of poor oral motor function beyond breastfeeding and give a roadmap for early oral motor development. In addition, it highlights interventions that may be implemented at home by parents or caregivers or supported by a treatment plan devised by a health care practitioner which could potentially include orthodontic or surgical intervention.

Much has been studied about the value of breastfeeding physiologically and immunologically, but it is also very important in neurologic development, both cognitively and children's readiness to transition to solid foods.^{15,16} This readiness includes oral motor development.

How to introduce solids

When the signs of readiness for eating are present (Table 2), the introduction of first foods should be fun and playful. Eating is important for many aspects of development including socializing. Children should eat with the family at mealtimes. They are eager to participate in activities that their family is doing. Eating at the table teaches the importance of a shared meal and encourages curiosity in foods all while developing oral, motor and social skills.

Baby led weaning is a practice that introduces children to solids typically after 6 months of age.¹⁷ It is preceded by

- Babies should have enough core strength to move themselves into a seated position independently before introducing foods.
- Choose a highchair that has a footrest. Knees and hips should be at a 90 degree angle and feet should be planted flat on the foot rest.
- Bottom and pelvis position should be positioned under the shoulders.
- The child should be able to maintain an upright position when eating.
- Baby is opening their mouths and moving their tongue (when they see you eating) and reaching for their parents' food and utensils.
- Baby is grasping things with their hands and bringing them to their mouths. The pincer grasp is not usually developed until 8-10 months, so movements will be with the whole hand.

Table 2: Signs of feeding readiness.

the ability to move into a seated position and maintain a seated posture in a high chair. In baby-led weaning the child's main source of nutrition continues to be breastmilk or formula with gentle introduction of whole foods. The parent slowly introduces foods that are least likely to cause food intolerance and that develops the skills of a child who can self-feed.¹⁶

But what if a parent expresses concern that their baby is not very interested in solids at six months? Is this an indication of oral motor dysfunction or a neurodevelopmental delay?

The World Health Organization states: "Breastfeeding is an unequalled way of providing ideal food for the healthy growth and development of infants... Review of evidence has shown that, on a population basis, exclusive breastfeeding for six months is the optimal way of feeding infants. Thereafter infants should receive complementary foods with continued breastfeeding up to 2 years of age or beyond."¹⁸

For infants who demonstrate little or no interest in solid foods, the nutrients from breastmilk alone can and will suffice until 9-12 months or later. As long as the infant is meeting growth and gestationally corrected developmental milestones, their nutritional needs are being adequately met. There is concern that after six months, infants will gradually begin to need more iron and zinc than that provided by breastmilk alone — at that point, additional nutrients can be obtained from small amounts of introduced, carefully selected solid foods or liquid supplements if necessary. If an infant continues to exclusively breastfeed, monitoring growth and iron status should suffice until the infant is ready. Exclusive breastfeeding will provide the majority of the required nutrition through the end of the first year of life.¹⁹

Red Flags

When children do not feel well or when they sustain an injury (a fall on the bottom while learning to walk, tripping and falling or failure to stay upright with their first try on a new two-wheeler!) they often hold their bodies in a position of "ease" or a position of comfort. This position of comfort is often one parents have "seen before" and possibly even sought treatment for (like a head tilt or torticollis). This posture or position was typically developed as a muscular compensation in response to a problem. The original problem or "dysfunction" could have been biomechanical, neurologic or physiologic and the plasticity of the brain and the proprioceptive input from the neuroreceptors in the fascia²⁰ and joints supports "survival" by creating compensatory motor plans to accomplish the desired end goal.²¹ Both preclinical and human studies indicate that specific neural plasticity and behavioral changes are dependent upon specific learning experiences.²² The more

specific the practice, the more neuroplastic connections are induced and cortical space dedicated to the task.²³

If a child exhibits red flag symptoms (Table 3), this indicates that he/she may be demonstrating compensatory behaviors, for example, due to "retained" reflexes. These primitive infant reflexes were initially required for survival but should integrate and dampen or disappear as the brain matures and replaces them with other functional responses. When these reflexes fail to fully integrate, the retained reflex can cause dysfunction in areas of the brain that control the development of gross motor, fine motor, sensory, cognitive and social, receptive and expressive (language, emotional and behavioral) skills.²⁴

- Open mouth posture; this includes daytime and/or during sleep.
- Decreased ROM of head, neck or other areas of the body.
- Snoring, grinding their teeth or drooling.
- Sleeping with knees tucked and buttocks in the air.
- Sleeping with head or neck in extension and excessive movement during sleep.
- New or increased night waking.
- Night Terrors.
- Apnea
- Waking cranky and tired, never rejuvenated after a full nights sleep.
- Hyperactive. Activity level higher than others at same age.
- Breathing through mouth.

Table 3: Red flag symptoms of compensatory oral motor strategies

If any red flags are identified by parents, a couple of visits with chiropractor or other health care provider might be necessary to overcome some physical obstacles, but a most effective tool in addition to the correction of any biomechanical problems is to facilitate habilitation of the oral musculature with a home exercise program (HEP).

Parents can be empowered by instructing them in an HEP to perform between visits. These simple tools can help support neural integration and get a child back on track using the ideal muscle correctly without compensating. If these do not help to restore appropriate movement, then further treatment with a qualified healthcare provider is recommended.

The Home Exercise Program

Rhythmic Movement Training is a movement-based

primitive (infant or neonatal) reflex integration program developed on the basis of the spontaneous rhythmic movements that infants normally do.²⁵ Spontaneous rhythmic baby movements are foundational to the development of motor abilities and other faculties e.g. speech, emotions and vision, and are necessary for the maturation of the infant's brain. When Rhythmic Movement Training is used with children with challenges, there is demonstrable improvement in motor abilities and control such as coordination, muscle tone as well as the integration of primitive reflexes. Additionally, many families have observed improvement in different areas such as feeding, speech, vision as well as difficulties with attention, hyperactivity, and reading and writing in older children. Rhythmic movement protocols are easily implemented by parents and caregivers but to be effective, the rhythmic exercises need to be done regularly (at least five days a week). Depending on the progress of the child, the exercises need to be updated and advanced to include follow up movements on a regular basis.²⁶

For infants old enough to imitate or mimic, parents can encourage the use a wide variety of facial expressions to develop the muscles of the mouth and face, no matter how young. For toddlers and older children, the parents can download a copy of a program like "The Story of Mr. Tongue" which guides the child through different oral motor movements: "The Story of Mr. Tongue. Here is Mr. Tongue. Mr. Tongue lives in a house, which is your mouth! Your teeth are his windows and your lips are his doors. Stick your tongue out. One day Mr. Tongue came out of his house. Point your tongue up. He looked up at the sky. Point your tongue down."²⁷ There are many more resources for oral motor movements to download from the internet to spark the imagination and expand a child's developmental program.

Singing is an excellent activity to encourage fluid and relaxed movement in the oral motor cavity.²⁸

Chronology of oral motor development

Between three to seven months, the infant will have developed oral motor patterns that include munching, lateral and diagonal jaw and lateral tongue movement patterns. If by six months the infant is sitting unassisted and has developed munching patterns, jaw movements and tongue lateralization, they should be successful with the thin and thick purees, foods that melt in their mouth and soft foods such as banana, sweet potato and avocado.

If any of the following red flags occur, it is important to refer to collaborate with a specialized health care provider (HCP). Some of these red flags are alerting us to a child who may not be able to breathe through their nose and or does not have full range of motion of their tongue:

- a. a pattern of swallowing with a tongue thrust pattern lasts beyond the six month mark,
- b. an open mouth posture ,
- c. persistence of the tongue at rest on the floor of their mouth,
- d. during swallow, the tongue thrusting forward or laterally against the molar ridge.

Between seven and nine months of age, more infants are moving into unsupported sitting, quadruped and crawling. This development supports jaw stability, breath support and fine motor development for self-feeding skills. Infants at this age now begin to be able to successfully manage "lumpy" purees. They are able to bite and munch "meltables" (a hard textured food that once in the mouth, melts) and begin to experiment with softer foods with parental observation and assistance. This is also when the development of rotary chewing begins. At this age children should be able to perform the following:

- Lip closure
- Scraping food off spoon with upper lip (head stays in neutral position and upper lip clears the spoon).
- Movement of food from side to side between the gums and into the cheek
- Increased tongue lateralization

If these skills are not present by nine months, consider referring your patient to a provider who specializes in feeding.

Rotary patterns begin emerging around nine to ten months of age. The child at this time has developed dissociation of his head from his body. This supports increased independence with biting pieces of food, lateralization of a bolus across the midline, and decreased spillage from the lateral sides of the mouth.

By 12 months of age, the child has developed the oral motor basics to support feeding. As time goes on, the child will practice these skills resulting in less messy eating and the ability to handle more challenging foods. At this age, a child should be able to manage foods with juice, and chew and swallow firmer foods such as cheese, soft fruits, vegetables, pasta and some meats.

Between 16 and 36 months of age, the child continues to develop their jaw strength, management of a bolus, chewing with a closed mouth, sweeping of small pieces of food into a bolus, and chewing 'harder' textured foods such as raw vegetables and meat. A full circular rotary chew should also be developed at this time to support eating all varieties of foods.²⁹

Table 4 outlines red flags that might be observed in a child with a feeding disorder. Some of these red flags can be addressed with patience and education, giving the child

time to integrate new skills. The most significant symptoms, though, are in bold lettering. If parents report or the chiropractor sees these red flag symptoms, they should have the child evaluated by a qualified HCP in a timely manner.

Conclusion

Clinical functional assessment skills are required across different professions that interface with pediatric patients who might present with these complaints. Collaborative assessment will result in the most complete differential

diagnosis of sole or comorbid causes of persistent joint dysfunction and postural alterations, oral motor dysfunction or feeding disorders. Cross professional education is critical to provide appropriate and timely care to children with oral motor dysfunction. It is in the best interest of the patient and practitioner to collaborate with other professionals to achieve the best outcome as the problems are often multifaceted and require a multimodal approach. There is a critical need for cross professional studies to further evaluate the efficacy of collaborative treatment protocols.

- **Arching or stiffening of the body during feeding**
- **Coughing or choking during feeding**
- **Being very irritable/fussy during or after feeding**
- Taking a really long time to feed/eat (more than 30-45 minutes)
- Frequent spitting up
- **Getting sick often with pneumonia or chest infections**
- **Gurgly, hoarse, or breathy voice**
- Less than normal weight gain or growth
- **Lots of leakage of food or liquid from the mouth**
- **Coughing, gagging or throwing up during or after meals**
- Stuffing mouth with food
- Holding food inside pockets in mouth for long periods
- Difficulty accepting new textures of food, avoidance behaviours to specific foods and textures (gagging, vomiting, blocking the spoon with hands or closed lips, crying, pushing food away, etc.)
- Abnormal bowel movements that last longer than a few days such as diarrhea, constipation or loose stool.
- **Skin reactions to foods (dry patches, hives, rashes)**

Note: If your child seems to be having a severe allergic reaction to food (difficulty breathing, turning red, developing hives or rash on the face/chest), you should seek medical help immediately.

Table 4: Eating red flags.

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Manual therapy for the pediatric population: a systematic review

Carol Parnell Prevost, Brian Gleberzon, Beth Carleo, Kristian Anderson, Morgan Cark and Katherine A. Pohlman
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ABSTRACT

Background: This systematic review evaluates the use of manual therapy for clinical conditions in the pediatric population, assesses the methodological quality of the studies found, and synthesizes findings based on health condition. We also assessed the reporting of adverse events within the included studies and compared our conclusions to those of the UK Update report. **Methods:** Six databases were searched using the following inclusion criteria: children under the age of 18 years old; treatment using manual therapy; any type of healthcare profession; published between 2001 and March 31, 2018; and English. Case reports were excluded from our study. Reference tracking was performed on six published relevant systematic reviews to find any missed article. Each study that met the inclusion criteria was screened by two authors to: (i) determine its suitability for inclusion, (ii) extract data, and (iii) assess quality of study. **Results:** Of the 3563 articles identified, 165 full articles were screened, and 50 studies met the inclusion criteria. Twenty-six articles were included in prior reviews with 24 new studies identified. Eighteen studies were judged to be of high quality. **Conditions evaluated were:** attention deficit hyperactivity disorder (ADHD), autism, asthma, cerebral palsy, clubfoot, constipation, cranial asymmetry, cuboid syndrome, headache, infantile colic, low back pain, obstructive apnea, otitis media, pediatric dysfunctional voiding, pediatric nocturnal enuresis, postural asymmetry, preterm infants, pulled elbow, suboptimal infant breastfeeding, scoliosis, suboptimal infant breastfeeding, temporomandibular dysfunction, torticollis, and upper cervical dysfunction. Musculoskeletal conditions, including low back pain and headache, were evaluated in seven studies. Twenty studies reported adverse events, which were transient and mild to moderate in severity. **Conclusions:** Fifty studies investigated the clinical effects of manual therapies for a wide variety of pediatric conditions. Moderate-positive overall assessment was found for 3 conditions: low back pain, pulled elbow, and premature infants. Inconclusive unfavorable outcomes were found for 2 conditions: scoliosis (OMT) and torticollis (MT). All other condition's overall assessments were either inconclusive favorable or unclear. Adverse events were uncommonly reported. More robust clinical trials in this area of healthcare are needed.

Effect of Vitamin D3 Supplementation on Severe Asthma Exacerbations in Children With Asthma and Low Vitamin D Levels: The VDKA Randomized Clinical Trial

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ABSTRACT

Importance: Severe asthma exacerbations cause significant morbidity and costs. Whether vitamin D3 supplementation reduces severe childhood asthma exacerbations is unclear. **Objective:** To determine whether vitamin D3 supplementation improves the time to a severe exacerbation in children with asthma and low vitamin D levels. **Design, setting, and participants:** The Vitamin D to Prevent Severe Asthma Exacerbations (VDKA) Study was a randomized, double-blind, placebo-controlled clinical trial of vitamin D3 supplementation to improve the time to severe exacerbations in high-risk children with asthma aged 6 to 16 years taking low-dose inhaled corticosteroids and with serum 25-hydroxyvitamin D levels less than 30 ng/mL. Participants were recruited from 7 US centers. Enrollment started in February 2016, with a goal of 400 participants; the trial was terminated early (March 2019) due to futility, and follow-up ended in September 2019. **Interventions:** Participants were randomized to vitamin D3, 4000 IU/d (n = 96), or placebo (n = 96) for 48 weeks and maintained with fluticasone propionate, 176 µg/d (6-11 years old), or 220 µg/d (12-16 years old). **Main outcomes and measures:** The primary outcome was the time to a severe asthma exacerbation. Secondary outcomes included the time to a viral-induced severe exacerbation, the proportion of participants in whom the dose of inhaled corticosteroid was reduced halfway through the trial, and the cumulative fluticasone dose during the trial. **Results:** Among 192 randomized participants (mean age, 9.8 years; 77 girls [40%]), 180 (93.8%) completed the trial. A total of 36 participants (37.5%) in the vitamin D3 group and 33 (34.4%) in the placebo group had 1 or more severe exacerbations. Compared with placebo, vitamin D3 supplementation did not significantly improve the time to a severe exacerbation: the mean time to exacerbation was 240 days in the vitamin D3 group vs 253 days in the placebo group (mean group difference, -13.1 days [95% CI, -42.6 to 16.4]; adjusted hazard ratio, 1.13 [95% CI, 0.69 to 1.85]; P = .63). Vitamin D3 supplementation, compared with placebo, likewise did not significantly improve the time to a viral-induced severe exacerbation, the proportion of participants whose dose of inhaled corticosteroid was reduced, or the cumulative fluticasone dose during the trial. Serious adverse events were similar in both groups (vitamin D3 group, n = 11; placebo group, n = 9). **Conclusions and relevance:** Among children with persistent asthma and low vitamin D levels, vitamin D3 supplementation, compared with placebo, did not significantly improve the time to a severe asthma exacerbation. The findings do not support the use of vitamin D3 supplementation to prevent severe asthma exacerbations in this group of patients.

Association of Exposure to Endocrine-Disrupting Chemicals During Adolescence With Attention-Deficit/Hyperactivity Disorder—Related Behaviors

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ABSTRACT

Importance: Attention-deficit/hyperactivity disorder (ADHD) is the most common childhood neurobehavioral disorder. Studies suggest that prenatal and early childhood exposure to endocrine-disrupting chemicals may be associated with ADHD, but the association during adolescence has not been studied to date. **Objective:** To evaluate the association between exposure to select endocrine-disrupting chemicals during adolescence and ADHD-related behaviors. **Design, setting, and participants:** For this cross-sectional analysis, data were collected from 205 adolescents in the New Bedford Cohort, an ongoing prospective birth cohort, between June 18, 2011, and June 10, 2014. The adolescents provided spot urine samples and underwent neurodevelopmental testing. Statistical analyses performed from January 15 to December 31, 2019, used a repeated-measures analysis with multivariate modified Poisson models to estimate the adjusted relative risk of ADHD-related behaviors associated with exposure to endocrine-disrupting chemicals. **Exposures:** Urinary biomarker concentrations of endocrine-disrupting chemicals or their metabolites, including phthalates, parabens, phenols, and triclocarban, were quantified. Summary exposure measures were created, combining biomarker concentrations of chemicals with a shared mechanism of action, exposure pathway, or chemical class. **Main outcomes and measures:** Behaviors related to ADHD were assessed with up to 14 indices from self-, parent-, and teacher-completed behavioral checklists using validated and standardized instruments; specifically, the Conners Attention Deficit Scale and the Behavior Assessment System for Children, Second Edition. Scores on each index were dichotomized to identify those with evidence of a significant behavioral problem, defined by each scale's interpretive guidelines. **Results:** Among the 205 participants, the mean (SD) age at assessment was 15.3 (0.7) years, with 112 girls (55%) and 124 non-Hispanic White participants (61%). The median urine concentrations were 0.45 $\mu\text{mol/L}$ of Σ antiandrogenic phthalates, 0.13 $\mu\text{mol/L}$ of Σ DEHP metabolites, 0.49 $\mu\text{mol/L}$ of Σ personal care product phthalates, 0.35 $\mu\text{mol/L}$ of Σ parabens, 0.02 $\mu\text{mol/L}$ of Σ bisphenols, and 0.02 $\mu\text{mol/L}$ of Σ dichlorophenols. A total of 82 (40%) had scores consistent with a significant behavioral problem, whereas 39 (19%) had an ADHD diagnosis. Each 2-fold increase in the sum of antiandrogenic phthalate concentrations was associated with a 1.34 (95% CI, 1.00-1.79) increase in the risk of significant ADHD-related behavior problems, whereas a 2-fold increase in the sum of dichlorophenols was associated with a 1.15 (95% CI, 1.01-1.32) increased risk. These associations tended to be stronger in male participants, but comparisons of sex-specific differences were imprecise. **Conclusions and relevance:** Endocrine-disrupting chemicals are used in a wide variety of consumer products resulting in ubiquitous exposure. The study findings suggest that exposure to some of these chemicals, particularly certain phthalates, during adolescence may be associated with behaviors characteristic of ADHD.

Associations Between Screen Use and Child Language Skills: A Systematic Review and Meta-analysis

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JAMA Pediatr, 2020;174(7):665—675. doi:[10.1001/jamapediatrics.2020.0327](https://doi.org/10.1001/jamapediatrics.2020.0327)

ABSTRACT

Importance: There is considerable public and scientific debate as to whether screen use helps or hinders early child development, particularly the development of language skills. **Objective:** To examine via meta-analyses the associations between quantity (duration of screen time and background television), quality (educational programming and co-viewing), and onset of screen use and children's language skills. **Data Sources:** Searches were conducted in MEDLINE, Embase, and PsycINFO in March 2019. The search strategy included a publication date limit from 1960 through March 2019. **Study Selection:** Inclusion criteria were a measure of screen use; a measure of language skills; and statistical data that could be transformed into an effect size. Exclusion criteria were qualitative studies; child age older than 12 years; and language assessment preverbal. **Data Extraction and Synthesis:** The following variables were extracted: effect size, child age and sex, screen measure type, study publication year, and study design. All studies were independently coded by 2 coders and conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. **Main Outcomes and Measures:** Based on a priori study criteria, quantity of screen use included duration of screen time and background television, quality of screen use included co-viewing and exposure to educational programs, and onset of screen use was defined as the age children first began viewing screens. The child language outcome included assessments of receptive and/or expressive language. **Results:** Participants totaled 18 905 from 42 studies included. Effect sizes were measured as correlations (r). Greater quantity of screen use (hours per use) was associated with lower language skills (screen time [$n = 38$; $r = -0.14$; 95% CI, -0.18 to -0.10]; background television [$n = 5$; $r = -0.19$; 95% CI, -0.33 to -0.05]), while better-quality screen use (educational programs [$n = 13$; $r = 0.13$; 95% CI, 0.02-0.24]; co-viewing [$n = 12$; $r = 0.16$; 95% CI, 0.07-0.24]) were associated with stronger child language skills. Later age at screen use onset was also associated with stronger child language skills [$n = 4$; $r = 0.17$; 95% CI, 0.07-0.27]. **Conclusions and Relevance:** The findings of this meta-analysis support pediatric recommendations to limit children's duration of screen exposure, to select high-quality programming, and to co-view when possible.

Early Formula Supplementation Trends by Race/Ethnicity Among US Children Born From 2009 to 2015

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ABSTRACT

Breastfeeding is the best source of nutrition for most infants. It is associated with a reduction in the risk for some health conditions for both infants and mothers.^{1,2} The American Academy of Pediatrics recommends that infants be fed only human milk for about the first 6 months of life, with continued breastfeeding along with complementary foods for at least 1 year.³ Previous studies have indicated that early formula supplementation is associated with the exclusivity and duration of breastfeeding,⁴ but, to our knowledge, trend analysis on formula supplementation among US children is lacking. This survey study examines the trends in early formula supplementation by race/ethnicity using data from the National Immunization Survey—Child (NIS-Child) of US children born from 2009 to 2015.

Predictors of Behavioral Changes After Adenotonsillectomy in Pediatric Obstructive Sleep Apnea: A Secondary Analysis of a Randomized Clinical Trial

Amal Isaiah, MD, PhD, Adam J. Spanier, MD, PhD, Lynn M. Grattan, PhD; et al

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ABSTRACT

Key Points

Question: Are polysomnographic parameters superior to parent-reported symptoms of upper-airway obstruction in predicting posttreatment behavioral outcomes in children with obstructive sleep apnea (OSA)? **Findings:** In this secondary analysis of the Childhood Adenotonsillectomy Trial involving 453 children, parent-reported symptoms of upper-airway obstruction were better indicators of most changes in children's behavior than were polysomnographic parameters. **Meaning:** Results of this secondary analysis suggest that most treatment-related behavioral changes in children with OSA were mediated by the changes in parent-reported sleep-disordered breathing severity alone.

Abstract

Importance: Adenotonsillectomy (AT) is associated with improved behavior in children with obstructive sleep apnea (OSA). However, it is unknown whether polysomnographic parameters are superior to the parent-reported severity of sleep-disordered breathing (SDB) in predicting behavioral changes after AT. **Objective:** To ascertain whether polysomnographic parameters vs parent-reported severity of SDB are better predictors of treatment-related behavioral changes in children with OSA. **Design, Setting, and Participants:** This ad hoc secondary analysis of the Childhood Adenotonsillectomy Trial (CHAT) downloaded and analyzed data from January 1 to January 31, 2020. Children aged 5 to 9 years with a polysomnographic diagnosis of OSA were enrolled in the CHAT and subsequently randomized to undergo either early AT or watchful waiting with supportive care. All outcome measures were obtained at baseline and at follow-up (7 months after randomization). **Interventions:** Early AT vs watchful waiting with supportive care. **Main Outcomes and Measures:** Postrandomization changes between the baseline and follow-up periods were derived from (1) T scores in 4 validated behavioral assessments (Conners Global Index parent and teacher versions, Behavior Rating Inventory of Executive Function metacognition index, and Child Behavior Checklist of total, internalizing, and externalizing behavior subscales); (2) 8 aggregated polysomnographic parameters representing the severity of obstruction, hypoxemia, sleep quality, and structure; and (3) the parent-reported severity of SDB measured by the Pediatric Sleep Questionnaire—Sleep-Related Breathing Disorder (PSQ-SRBD) scale. The treatment-related changes in each of the behavioral outcomes attributable to changes in SDB severity (represented by the subjective PSQ-SRBD score and objective polysomnographic parameters) were measured and compared using mediation analysis. **Results:** A total of 453 children were assessed at baseline, of whom 234 were girls (52%) and the mean (SD) age was 6.6 (1.4) years. The postrandomization changes in 7 of 8 behavioral outcome measures between the baseline and follow-up periods were partially mediated by the changes in PSQ-SRBD scores (range of nonzero causally mediated effects, 2.4-3.5), without contribution from any of the polysomnographic parameters. **Conclusions and Relevance:** This secondary analysis of a national randomized clinical trial found that most treatment-related behavioral changes in children with OSA were mediated by the changes in parent-reported SDB severity alone. These findings suggest that polysomnographic parameters provide clinicians with limited means to predict the improvement in neurobehavioral morbidity in OSA.

Defining the Anatomy of the Neonatal Lingual Frenulum

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Clinical Anatomy, 32:824–835 (2019) <https://doi.org/10.1002/ca.23410>

ABSTRACT

The lingual frenulum is recognized as having the potential to limit tongue mobility, which may lead to difficulties with breastfeeding in some infants. There is extensive variation between individuals in the appearance of the lingual frenulum but an ambiguous relationship between frenulum appearance and functional limitation. An increasing number of infants are being diagnosed with ankyloglossia, with growing uncertainty regarding what can be considered “normal” lingual frenulum anatomy. In this study, microdissection of four fresh tissue premature infant cadavers shows that the lingual frenulum is a dynamic, layered structure formed by oral mucosa and the underlying floor of mouth fascia, which is mobilized into a midline fold with tongue elevation and/or retraction. Genioglossus is suspended from the floor of mouth fascia, and in some individuals can be drawn up into the fold of the frenulum. Branches of the lingual nerve are located superficially on the ventral surface of the tongue, immediately beneath the fascia, making them vulnerable to injury during frenotomy procedures. This research challenges the longstanding belief that the lingual frenulum is a midline structure formed by a submucosal “band” or “string” and confirms that the neonatal lingual frenulum structure replicates that recently described in the adult. This article provides an anatomical construct for understanding and describing variability in lingual frenulum morphology and lays the foundation for future research to assess the impact of specific anatomic variants of lingual frenulum morphology on tongue mobility. *Clin. Anat.* 32:824–835, 2019. © 2019 The Authors. *Clinical Anatomy* published by Wiley Periodicals, Inc. on behalf of American Association of Clinical Anatomists.

Etiology of Autism Spectrum Disorders and Autistic Traits Over Time

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ABSTRACT

Key Points

Question: Has association between genetic factors and autism spectrum disorders (ASDs) changed over time? **Findings:** In this study, data were available from 2 twin cohorts, one born between 1982 and 2008 (n = 22 678 pairs) and the other between 1992 and 2008 (n = 15 279 pairs). Genetic factors were associated with ASD and autistic traits and the relative importance of these factors was consistent over time, whereas environmental factors played a smaller role. **Meaning:** Environmental factors associated with ASD have not increased in importance over time and are unlikely to explain the apparent increase in the prevalence of ASD.

Abstract

Importance: The frequency with which autism spectrum disorders (ASDs) are diagnosed has shown a marked increase in recent years. One suggestion is that this is partly because of secular changes in the environment, yet to our knowledge this hypothesis lacks evidence. **Objective:** To assess whether the relative importance of genetic and environmental associations with ASD and autistic traits has changed over a 16-year and 26-year period. **Design, Setting, and Participants:** A twin design was used to assess whether the heritability of ASD and autistic traits has changed over time. Data from 2 nationwide Swedish twin cohorts was used: the Swedish Twin Registry (STR; participants born between January 1982 and December 2008) and the Child and Adolescent Twin Study in Sweden (CATSS; participants born between January 1992 and December 2008). Autism spectrum disorder diagnoses were identified for twins in the STR, with follow-up to 2013. Questionnaires assigned screening diagnoses of ASD to CATSS participants and assessed autistic traits. Analyses were performed from September 1, 2018, to March 31, 2019. **Exposures:** Each sample was divided into several birth cohorts covering 1982 to 1991 (for the STR only), 1992-1995, 1996-1999, 2000-2003, and 2004-2008. **Outcomes:** We assessed whether the genetic and environment variance underlying autistic traits changed across birth cohorts and examined whether the relative contribution of genetics and environment to liability for autism changed across birth cohorts. **Results:** Data were available for 22 678 twin pairs (5922 female same-sex pairs [26.1%], 5563 male same-sex pairs [24.5%], and 11193 opposite-sex pairs [49.4%]) in the STR and 15 280 pairs (4880 female same-sex pairs [31.9%], 5092 male same-sex pairs [33.3%], and 5308 opposite-sex pairs [34.7%]) in CATSS. The heritability of ASD diagnoses in the STR ranged from 0.88 (95% CI, 0.74-0.96) to 0.97 (95% CI, 0.89-0.99). The heritability of screening diagnoses in CATSS varied from 0.75 (95% CI, 0.58-0.87) to 0.93 (95% CI, 0.84-0.98). Autistic traits showed a modest variance increase over time that was associated with increases in genetic and environmental variance, with the total variance increasing from 0.95 (95% CI, 0.92-0.98) to 1.17 (95% CI, 1.13-1.21) over time. **Conclusions and Relevance:** Weak evidence was found for changes in the genetic and environmental factors underlying ASD and autistic traits over time. Genetic factors played a consistently larger role than environmental factors. Environmental factors are thus unlikely to explain the increase in the prevalence of ASD.

Comparison of Acetaminophen (Paracetamol) With Ibuprofen for Treatment of Fever or Pain in Children Younger Than 2 Years A Systematic Review and Meta-analysis

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ABSTRACT

IMPORTANCE: Acetaminophen (paracetamol) and ibuprofen are the most widely prescribed and available over-the-counter medications for management of fever and pain in children. Despite the common use of these medications, treatment recommendations for young children remain divergent. **Objective:** To compare acetaminophen with ibuprofen for the short-term treatment of fever or pain in children younger than 2 years. **Data sources:** Systematic search of the databases MEDLINE, Embase, CINAHL, and the Cochrane Central Register of Controlled Trials and the trial registers ClinicalTrials.gov and the Australian New Zealand Clinical Trials Registry from inception to March 2019, with no language limits. **Study selection:** Studies of any design that included children younger than 2 years and directly compared acetaminophen with ibuprofen, reporting antipyretic, analgesic, and/or safety outcomes were considered. There were no limits on length of follow-up. **Data extraction and synthesis:** Following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guideline, 2 authors independently extracted data and assessed quality. Data were pooled using a fixed-effects method if I² was less than 50% and using a random-effects method if I² was 50% or greater. **Main outcomes and measures:** The primary outcomes were fever or pain within 4 hours of treatment onset. Safety outcomes included serious adverse events, kidney impairment, gastrointestinal bleeding, hepatotoxicity, severe soft tissue infection, empyema, and asthma and/or wheeze. **Results:** Overall, 19 studies (11 randomized; 8 nonrandomized) of 241 138 participants from 7 countries and various health care settings (hospital-based and community-based) were included. Compared with acetaminophen, ibuprofen resulted in reduced temperature at less than 4 hours (4 studies with 435 participants; standardized mean difference [SMD], 0.38; 95% CI, 0.08-0.67; P = .01; I² = 49%; moderate quality evidence) and at 4 to 24 hours (5 studies with 879 participants; SMD, 0.24; 95% CI, 0.03-0.45; P = .03; I² = 57%; moderate-quality evidence) and less pain at 4 to 24 hours (2 studies with 535 participants; SMD, 0.20; 95% CI, 0.03-0.37; P = .02; I² = 25%; moderate-quality evidence). Adverse events were uncommon. Acetaminophen and ibuprofen appeared to have similar serious adverse event profiles (7 studies with 27 932 participants; ibuprofen vs acetaminophen: odds ratio, 1.08; 95% CI, 0.87-1.33; P = .50, I² = 0%; moderate-quality evidence). **Conclusions and relevance:** In this study, use of ibuprofen vs acetaminophen for the treatment of fever or pain in children younger than 2 years was associated with reduced temperature and less pain within the first 24 hours of treatment, with equivalent safety.

Racial Differences in Food Allergy Phenotype and Health Care Utilization among US Children

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The Journal of Allergy and Clinical Immunology: In Practice, Volume 5, Issue 2, March—April 2017, Pages 352-357.e1

<https://pubmed.ncbi.nlm.nih.gov/27888035/>

ABSTRACT

Background: Food allergy (FA) is a prevalent condition in the United States, but little is known about its phenotypes in racial minority groups. **Objective:** The objective of this study was to characterize disease phenotypes and disparities in health care utilization among African American (AA), Hispanic, and white children with FA. **Methods:** We conducted a large, 2-center, retrospective cohort study of children aged 0-17 years with FA seen in allergy/immunology clinics at 2 urban tertiary care centers in the United States. We used multiple logistic regression analyses adjusted for age, gender, and insurance. **Results:** The cohort of 817 children was composed of 35% AA, 12% Hispanic, and 53% non-Hispanic white. Compared with non-Hispanic white children, AA children had significantly higher odds of having asthma and eczema (P < .01), and significantly higher odds of allergy to wheat, soy, corn, fish, and shellfish (P < .01). Compared with non-Hispanic white children, Hispanic children had significantly higher odds of allergy to corn, fish, and shellfish (P < .01), and higher odds of eczema (P < .01), but a similar rate of asthma (P = .44). In this cohort, 55%, 18%, and 11% of AA, Hispanic, and white children were covered by Medicaid, respectively (P < .00001). Compared with whites, AA and Hispanic children had a shorter duration of follow-up for FA with an allergy specialist and higher rates of FA-related anaphylaxis and emergency department visits (P < .01). **Conclusions:** FA phenotypes and health care utilization differ among children of different racial and/or ethnic backgrounds in the United States that put AA and Hispanic children at higher risks of adverse outcome than white children. These differences include coexistent atopic conditions, less well recognized food allergens, and higher rates of anaphylaxis.

CURRENT ARTICLES PUBLISHED ON COVID-19:

Editor's note: We and our patients are flooded daily with ever evolving information on COVID -19. Sorting out science, pseudoscience and politics has become the HCP's challenge daily. It is important to be aware of what is being published and read by health care providers and the public (our patients include) seeking information to navigate these challenging time. It is important to remain current so that we are prepared to offer thoughtful guidance.

Mask Exemptions During the COVID-19 Pandemic – A New Frontier for Clinicians

Dorfman D, Raz M.

JAMA Health Forum, Published online July 10, 2020. Accessed at <https://jamanetwork.com/channels/health-forum/fullarticle/2768376>

ABSTRACT

Masking or face covering amid the global coronavirus disease 2019 (COVID-19) pandemic has emerged as a highly polarizing practice, with surprising partisan divisions. While masking remains contentious, there is bipartisan agreement among policy makers that medical exemptions for masking are necessary and appropriate. Yet there is a dearth of guidance for clinicians on how to approach a request for an exemption. We analyze the medical and legal standards to guide this debate.

Pregnancy Outcomes Among Women With and Without Severe Acute Respiratory Syndrome Coronavirus 2 Infection

Adhikari EH, Moreno W, Zofkie AC, et al.

JAMA Netw Open, 2020;3(11):e2029256. doi:[10.1001/jamanetworkopen.2020.29256](https://doi.org/10.1001/jamanetworkopen.2020.29256)

ABSTRACT

Importance: Published data suggest that there are increased hospitalizations, placental abnormalities, and rare neonatal transmission among pregnant women with coronavirus disease 2019 (COVID-19). **Objectives:** To evaluate adverse outcomes associated with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in pregnancy and to describe clinical management, disease progression, hospital admission, placental abnormalities, and neonatal outcomes. **Design, Setting, and Participants:** This observational cohort study of maternal and neonatal outcomes among delivered women with and without SARS-CoV-2 during pregnancy was conducted from March 18 through August 22, 2020, at Parkland Health and Hospital System (Dallas, Texas), a high-volume prenatal clinic system and public maternity hospital with widespread access to SARS-CoV-2 testing in outpatient, emergency department, and inpatient settings. Women were included if they were tested for SARS-CoV-2 during pregnancy and delivered. For placental analysis, the pathologist was blinded to illness severity. **Exposures:** SARS-CoV-2 infection during pregnancy. **Main Outcomes and Measures:** The primary outcome was a composite of preterm birth, preeclampsia with severe features, or cesarean delivery for abnormal fetal heart rate among women delivered after 20 weeks of gestation. Maternal illness severity, neonatal infection, and placental abnormalities were described. **Results:** From March 18 through August 22, 2020, 3374 pregnant women (mean [SD] age, 27.6 [6] years) tested for SARS-CoV-2 were delivered, including 252 who tested positive for SARS-CoV-2 and 3122 who tested negative. The cohort included 2520 Hispanic (75%), 619 Black (18%), and 125 White (4%) women. There were no differences in age, parity, body mass index, or diabetes among women with or without SARS-CoV-2. SARS-CoV-2 positivity was more common among Hispanic women (230 [91%] positive vs 2290 [73%] negative; difference, 17.9%; 95% CI, 12.3%-23.5%; $P < .001$). There was no difference in the composite primary outcome (52 women [21%] vs 684 women [23%]; relative risk, 0.94; 95% CI, 0.73-1.21; $P = .64$). Early neonatal SARS-CoV-2 infection occurred in 6 of 188 tested infants (3%), primarily born to asymptomatic or mildly symptomatic women. There were no placental pathologic differences by illness severity. Maternal illness at initial presentation was asymptomatic or mild in 239 women (95%), and 6 of those women (3%) developed severe or critical illness. Fourteen women (6%) were hospitalized for the indication of COVID-19. **Conclusions and Relevance:** In a large, single-institution cohort study, SARS-CoV-2 infection during pregnancy was not associated with adverse pregnancy outcomes. Neonatal infection may be as high as 3% and may occur predominantly among asymptomatic or mildly symptomatic women. Placental abnormalities were not associated with disease severity, and hospitalization frequency was similar to rates among nonpregnant women.

Best Practices for COVID-19—Positive or Exposed Mothers—Breastfeeding and Pumping Milk

Sandra E. Sullivan, MD, IBCLC and Lindsay A. Thompson, MD, MS .

JAMA Pediatr, Published online October 26, 2020. doi:[10.1001/jamapediatrics.2020.3341](https://doi.org/10.1001/jamapediatrics.2020.3341)

ABSTRACT

Breast milk protects infants from many illnesses and is the best food for most infants. During the coronavirus disease 2019 (COVID-19) pandemic, mothers who may be exposed or infected might be unsure about feeding their infant breast milk. Mothers, along with their family and health care professionals, should decide whether and how to start or continue breastfeeding. We do not know if mothers with COVID-19 can spread the virus to infants through breast milk, but it is unlikely based on what we do know. Women who have had COVID-19 have high amounts of antibodies to the virus in their breast milk, which coat the inside of infants' noses and mouths, helping to block infection. Fresh (not frozen) milk is ideal because it has live infection-fighting cells and offers the most protection.

Factors associated with US adults' likelihood of accepting COVID-19 vaccination

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ABSTRACT

IMPORTANCE: The development of a coronavirus disease 2019 (COVID-19) vaccine has progressed at unprecedented speed. Widespread public uptake of the vaccine is crucial to stem the pandemic. **Objective:** To examine the factors associated with survey participants' self-reported likelihood of selecting and receiving a hypothetical COVID-19 vaccine. **Design, Setting, and Participants:** A survey study of a nonprobability convenience sample of 2,000 recruited participants including a choice-based conjoint analysis was conducted to estimate respondents' probability of choosing a vaccine and willingness to receive vaccination. Participants were asked to evaluate their willingness to receive each hypothetical vaccine individually. The survey presented respondents with 5 choice tasks. In each, participants evaluated 2 hypothetical COVID-19 vaccines and were asked whether they would choose vaccine A, vaccine B, or neither vaccine. Vaccine attributes included efficacy, protection duration, major adverse effects, minor adverse effects, US Food and Drug Administration (FDA) approval process, national origin of vaccine, and endorsement. Levels of each attribute for each vaccine were randomly assigned, and attribute order was randomized across participants. Survey data were collected on July 9, 2020. **Main Outcomes and Measures:** Average marginal component effect sizes and marginal means were calculated to estimate the relationship between each vaccine attribute level and the probability of the respondent choosing a vaccine and self-reported willingness to receive vaccination. **Results:** A total of 1971 US adults responded to the survey (median age, 43 [interquartile range, 30-58] years); 999 (51%) were women, 1432 (73%) White, 277 (14%) were Black, and 190 (10%) were Latinx. An increase in efficacy from 50% to 70% was associated with a higher probability of choosing a vaccine (coefficient, 0.07; 95% CI, 0.06-0.09), and an increase from 50% to 90% was associated with a higher probability of choosing a vaccine (coefficient, 0.16; 95% CI, 0.15-0.18). An increase in protection duration from 1 to 5 years was associated with a higher probability of choosing a vaccine (coefficient, 0.05 95% CI, 0.04-0.07). A decrease in the incidence of major adverse effects from 1 in 10,000 to 1 in 1,000,000 was associated with a higher probability of choosing a vaccine (coefficient, 0.07; 95% CI, 0.05-0.08). An FDA emergency use authorization was associated with a lower probability of choosing a vaccine (coefficient, -0.03; 95% CI, -0.04 to -0.01) compared with full FDA approval. A vaccine that originated from a non-US country was associated with a lower probability of choosing a vaccine (China: -0.13 [95% CI, -0.15 to -0.11]; UK: -0.04 [95% CI, -0.06 to -0.02]). Endorsements from the US Centers for Disease Control and Prevention (coefficient, 0.09; 95% CI, 0.07-0.11) and the World Health Organization (coefficient, 0.06; 95% CI, 0.04-0.08), compared with an endorsement from President Trump were associated with higher probabilities of choosing a vaccine. Analyses of participants' willingness to receive each vaccine when assessed individually yielded similar results. An increase in efficacy from 50% to 90% was associated with a 10% higher marginal mean willingness to receive a vaccine (from 0.51 to 0.61). A reduction in the incidence of major side effects was associated with a 4% higher marginal mean willingness to receive a vaccine (from 0.54 to 0.58). A vaccine originating in China was associated with a 10% lower willingness to receive a vaccine vs one developed in the US (from 0.60 to 0.50). Endorsements from the Centers for Disease Control and Prevention and World Health Organization were associated with increases in willingness to receive a vaccine (7% and 6%, respectively) from a baseline endorsement by President Trump (from 0.52 to 0.59 and from 0.52 to 0.58, respectively). **Conclusions and Relevance:** In this survey study of US adults, vaccine-related attributes and political characteristics were associated with self-reported preferences for choosing a hypothetical COVID-19 vaccine and self-reported willingness to receive vaccination. These results may help inform public health campaigns to address vaccine hesitancy when a COVID-19 vaccine becomes available.