

HEALTH EVIDENCE REVIEW COMMISSION (HERC)

EVALUATION OF EVIDENCE: APPLIED BEHAVIOR ANALYSIS FOR AUTISM SPECTRUM DISORDERS

DRAFT as posted for public comment 11/14/2013-12/15/2013

BACKGROUND

Oregon Senate Bill 365 was passed by the Oregon legislature in the 2013 regular session. That bill directs the Health Evidence Review Commission to evaluate applied behavioral analysis (ABA) as a treatment for autism spectrum disorder (ASD) for the purposes of updating the prioritized list of health services. The bill also directs insurers to cover ABA therapy up to a maximum of 25 hours per week for children who initially seek care before age nine, and allows continued coverage until age 18. Health plans that provide coverage to OEGB and PEGB are required to begin coverage in 2015, and all other health plans are required to begin coverage in 2016.

At their August 8, 2013 meeting, HERC assigned the evaluation of ABA to the Evidence-based Guidelines Subcommittee (EbGS). HERC further directed EbGS to conduct this evaluation using the process designed for the development of coverage guidances; but as Senate Bill 365 mandates coverage for OEGB/PEGB and commercial carriers, this process is only expected to result in a document used to inform potential changes to the Prioritized List.

This document reflects a review of the existing evidence of the effectiveness of ABA by the Center for Evidence-based Policy and an initial set of staff recommendations based on this evidence for EbGS discussion. EbGS will meet September 12, 2013 to consider these recommendations and hear public comment from patients, doctors, families, and any other interested members of the public. EbGS members will discuss the evidence and the testimony they hear. They may choose to accept the staff conclusions as written or make changes to them. This may happen at the September meeting or a meeting later in the year. The resulting version of the evidence evaluation and conclusions will then be posted on the HERC website at www.oregon.gov/OHA/OHPR/Pages/HERC for a 30-day written public comment period.

EbGS will then meet to discuss the public input and any additional sources of evidence submitted that warrant consideration, resulting in a finalized version of this document to be forwarded to the Value-Based Benefits Subcommittee (VbBS). VbBS will use the EbGS conclusions to determine what changes may be needed to the Prioritized List of Health Services and if there are any issues that would be involved in implementing these changes in OHP. The evidence evaluation and any changes to the Prioritized List will eventually need final approval by the full HERC. Any changes to the Prioritized List

affecting OHP coverage of ABA would go into effect sometime between October 1, 2014 and April 1, 2015.

EVIDENCE SOURCES

Warren, Z., Veenstra-VanderWeele, J., Stone, W., Bruzek, J.L., Nahmias, A.S., Foss-Feig, J.H., et al. (2011). *Therapies for children with autism spectrum disorders. Comparative effectiveness review no. 26.* (Prepared by the Vanderbilt Evidence-based Practice Center under Contract No. 290-2007-10065-I). AHRQ Publication No. 11-EHC029-EF. Rockville, MD: Agency for Healthcare Research and Quality. April 2011. Retrieved from <http://effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productid=651>

Lounds Taylor, J., Dove, D., Veenstra-VanderWeele, J., Sathe, N.A., McPheeters, M.L., Jerome, R.N., et al. (2012). *Interventions for adolescents and young adults with Autism Spectrum Disorders. Comparative Effectiveness Review No. 65.* (Prepared by the Vanderbilt Evidence-based Practice Center under Contract No. 290-2007-10065-I.) AHRQ Publication No. 12-EHC063-EF. Rockville, MD: Agency for Healthcare Research and Quality. Retrieved from <http://effectivehealthcare.ahrq.gov/index.cfm/search-for-guides-reviews-and-reports/?productid=1197&pageaction=displayproduct>

Maglione, M., Motala, A., Shanman, R., Newberry, S., Schneider Chafen, J., & Shekelle, P. (2012). *AHRQ Comparative Effectiveness Review Surveillance Program: Therapies for Children with Autism Spectrum Disorders, 2nd Assessment.* Rockville, MD: Agency for Healthcare Research and Quality. Retrieved from <http://effectivehealthcare.ahrq.gov/search-for-guides-reviews-and-reports/?pageaction=displayproduct&productID=1536>

- *List of included studies in Maglione 2012 provided in Appendix D*

Oono, I.P., Honey, E.J., & McConachie, H. (2013). Parent-mediated early intervention for young children with autism spectrum disorders (ASD). *Cochrane Database of Systematic Reviews*, Issue 4. Retrieved from <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD009774.pub2/abstract>

- *List of included studies in Oono 2013 provided in Appendix D*

Glossary Sources

Agency for Healthcare Research and Quality (AHRQ) Effective Health Care Program. (n.d.). Glossary of terms. Retrieved from <http://effectivehealthcare.ahrq.gov/index.cfm/glossary-of-terms/>

National Cancer Institute (NCI) at the National Institutes of Health (NIH). (n.d.). NCI dictionary of cancer terms. Retrieved from <http://www.cancer.gov/dictionary>

The summary of evidence in this document is derived directly from these evidence sources, and portions are extracted verbatim. Studies identified in the Maglione 2012 surveillance document are presented in additional detail, and conclusions regarding how those more recent studies impact the overall evidence base are made by HERC members.

SUMMARY OF EVIDENCE

Clinical Background

The following clinical background summary is extracted from Warren (2011).

“Autism Spectrum Disorder (ASD) is a group of pervasive developmental disorders (PDD) that includes Autistic Disorder, Asperger Syndrome, and Pervasive Developmental Disorder, Not Otherwise Specified (PDD-NOS)¹; it is estimated to affect 1 out of every 110 children. Autism spectrum disorder is characterized by impairments in communication, behavior, and social interaction and by repetitive behaviors coupled with obsessive interests, and is often accompanied by comorbid conditions, such as epilepsy and mental retardation.

A range of interventions are available for the treatment of ASD and the symptoms commonly associated with ASD (e.g., anxiety, sensory difficulties). Treatments for ASD focus on improving core deficits in social communication, as well as addressing challenging behaviors to improve functional engagement in developmentally appropriate activities. Common behavioral strategies used in the treatment of ASD are based on learning theory and make use of procedures such as reinforcement, prompting, and shaping techniques to increase the rate of positive behaviors and reduce the frequency of unwanted behaviors. Positive reinforcement and other principles to build communication, play, social, academic, self-care, work, and community living skills and to reduce problem behaviors in individuals with ASD have been used by behavioral therapists.

Applied behavioral analysis (ABA) is a general intervention approach for the treatment of ASD. It is a systemic application, at any time during a child’s day, of behavioral principles to modify behavior. Some ABA techniques involve instruction that is directed by adults in a highly structured fashion, while others make use of the learner’s natural interests and follow his or her initiations. Other techniques teach skills in the context of ongoing activities. All skills are broken down into small steps or components, and learners are provided many repeated opportunities to learn and practice skills in a variety of settings, with abundant

¹ The definition of autism spectrum disorder has been revised in the DSM-5 manual published in May 2013. The diagnostic terms listed here were in effect at the date of this publication in 2011, as detailed in DSM-IV-TR.

positive reinforcement. Different applications of ABA include Positive Behavioral Interventions and Support (PBS), Pivotal Response Training (PRT), Incidental Teaching, Milieu Therapy, Verbal Behavior, and Discrete Trial Training (also known as Discrete Trial Learning), among others.

Early intensive behavioral intervention (EIBI) ... is a much more prescriptive, manualized program that integrates components of ABA. Children in an EIBI program have therapy approximately 40 hours per week over the course of up to two years. Proponents of EIBI recommend starting therapy as early as possible and preferably before the age of three. Two manualized EIBI programs are the University of California, Los Angeles (UCLA)/Lovaas model and the Early Start Denver Model (ESDM). Both programs involve high intensity instruction using ABA techniques but have several differences. The UCLA/Lovaas method uses one-on-one therapy sessions and discrete trial teaching. The ESDM uses ABA principles with developmental and relationship-based approaches for young children. Other treatment approaches exist that emphasize parent training for treatment (e.g., Pivotal Response Training, Hanen More than Words) and/or use joint attention interventions, symbolic play, and play-based interventions (e.g., Stepping Stones Triple P Program, Relationship Development Intervention (RDI), Mifne model). These therapies have not been manualized but are based on ABA principles.”

[\[Evidence Source\]](#)

Evidence Review

Children Ages Two to Twelve

EIBI and Other ABA Interventions

The Warren (2011) AHRQ review included all study designs as long as there were at least 10 participants. A total of 30 discrete studies were included, with the largest study population being 78 participants. The longest duration of treatment in any included study was three years. The mean age of children at intake in the included studies ranged from 21 to 66 months for EIBI interventions and from 42 months to 10.8 years for other ABA interventions. Authors reach the following conclusions:

“The evidence suggests that early intensive behavioral and developmental intervention (EIBDI) may improve core areas of deficit for individuals with ASDs; however, randomized controlled trials (RCTs) are few and include small numbers of participants. In addition, there are no direct comparison trials. Within this category, studies of UCLA/Lovaas-based interventions report greater improvements in cognitive performance, language skills, and adaptive behavior skills than other broadly defined treatments. However, strength of evidence is

currently low. In addition, the consistency of benefit is lacking, in that not all children demonstrate rapid gains, and many children continue to display substantial impairment. Although positive results are reported for the effects of intensive interventions that use a developmental framework, such as ESDM, evidence for this type of intervention is currently insufficient because few studies have been published to date.

Less intensive interventions focusing on providing parent training for bolstering social communication skills and managing challenging behaviors have also been studied. Some interventions have shown short-term gains in social communication and language use, but the current evidence base for such treatment remains insufficient. Strength of evidence is also considered insufficient for play- and interaction-based approaches.

Only one study was identified that directly addressed whether there are any modifiers of outcomes for different ABA-based behavioral approaches. It examined the impact of which provider (parent vs. professional) delivered the UCLA/Lovaas protocol-based interventions. There was no significant difference in outcomes for children receiving the intervention in a clinical setting vs. at home from highly trained parents.

Other potential correlates that warrant further study because of conflicting data include pretreatment IQ and language skills, and age of initiation of treatment (with earlier age potentially associated with better outcomes). Social responsiveness and imitation skills have been suggested as skills that may correlate with improved treatment response in UCLA/Lovaas treatment, whereas “aloof” subtypes of ASDs may be associated with less robust changes in IQ. Other studies have seen specific improvement in children with PDD-NOS vs. Autistic Disorder diagnoses, which may be indicative of baseline symptom differences. However, many other studies have failed to find a relationship between autism symptoms and treatment response.

Research on very young children is preliminary, with four studies identified. One good-quality RCT suggested benefit from the use of ESDM in young children, with improvements in adaptive behavior, language, and cognitive outcomes. Diagnostic shifts within the autism spectrum were reported in close to 30 percent of children but were not associated with clinically significant improvements in Autism Diagnostic Observation Schedule severity scores or other measures.”

There was no evidence identified in the Warren review that addressed treatment effectiveness in specific subgroups such as race, ethnicity, gender or socioeconomic

status, other than age. Details of all comparative studies that reported comparative statistics are provided in the table below.

Table 1. Comparative Studies included in Warren 2011

Author	Study Design	Intervention Intensity	Intervention Duration	Summary of Outcome
Smith 2000	RCT, intensive vs. parent training	Intensive: 30 hrs/wk with therapist, 5 hrs/wk with parents X 3 months Parent: taught techniques from Lovaas manual 2 sessions/wk	intensive: 2-3 yrs parent: 3-9 mos	Intensive group had improved IQ, developmental scores compared to parent training, as well as in 1 communication score, but not in 3 others, and no sig diff in adaptive function MIXED
Drew 2002	RCT, parent training vs. local services (ST, OT, ABA, home worker)	Parent: 6.3 hrs/wk Local: 3.5 hrs/wk	Not specified; follow up at 1 year	No sig diff between groups in cognitive ² outcomes. parent group had some better communication outcomes MIXED
Aldred 2004	RCT, social communication intervention vs. routine care (not described)	Intervention: monthly treatment sessions X 6 months (time not specified), then less frequent for another 6 months Control: routine care	1 year	Intervention group had better language scores, parent asynchrony. No diff in shared attention MIXED
Eikeseth 2002/ 2007	Non-randomized CT, Lovaas behavioral treatment vs. eclectic (TEACCH, sensory-motor therapies, ABA)	Lovaas: 28 hrs/wk Eclectic: 29 hrs/wk	Not specified; first follow up at 1 year	Lovaas group had sig more improvement than eclectic in IQ, communication, adaptive behavior at both 1 and 8 year follow up for most measures POSITIVE
Reed 2007	Non-randomized CT, high intensity ABA vs. low intensity ABA	High: mean 30 hrs/wk Low: mean 13 hrs/wk	Not specified	No diff in autism severity, adaptive behavior. Mixed result for cognitive, with high intensity scoring better on one measure but not another MIXED
Howard 2005	Prospective cohort, intensive ABA vs.	ABA: 25-30 hrs/wk for age <3, 35-40 for	Follow up at 14 mos	ABA group had sig higher scores than mean of the

² Educational, cognitive, and academic outcomes are reported together and noted as “cognitive” unless specified otherwise.

Author	Study Design	Intervention Intensity	Intervention Duration	Summary of Outcome
	intensive eclectic (delivered in school) vs. non-intensive public early intervention	age >3 plus parent training Intensive eclectic: not specified Public EI: not specified		other two groups for all outcome measures except motor skills POSITIVE
Remington 2007	Prospective cohort, home-based early intervention (parent delivered with tutors) vs. local education standard treatment	EI: mean 26 hrs/wk Control: not specified	2 years	EI group had sig higher scores for most outcomes, including social skills, communication, adaptive behavior, cognitive function POSITIVE
Cohen 2006	Prospective cohort, EIBI (Lovaas) vs. services from public school (parent choice)	Intervention: 35-40 hrs/wk, 47 wks/yr Control: not specified	3 years	Intervention group had higher IQ, were more likely in regular classroom and had higher adaptive scores; no sig diff in communication POSITIVE
Stahmer 2001	Prospective cohort, parent information support group and education course on PRT vs. education course only (control)	2 hrs/week for intervention group vs 1 hr/wk for control	12 weeks	Sig more parents in the intervention group correctly used PRT techniques, and their children had improved communication POSITIVE
Zachor 2007 (appears to be a subset of Itzchak 2009)	Prospective cohort, behavioral vs. eclectic	Behavioral: 1 to 1 35 hrs/wk Eclectic: special ed teacher, various therapists (OT, ST), parent training, at least 16 hrs/wk	Not specified	Sig improved overall severity, communication behavioral group compared to eclectic, no sig diff in social skills POSITIVE
Hayward 2009/ Eikeseth 2009	Prospective cohort, clinic based vs. parent managed	Clinic: 37 hrs/week Parent: 34 hrs/week (mean supervision hrs/mo = 5)	1 year	No diffs between groups in communication, adaptive behavior, cognitive/academic NEGATIVE
Eldevik 2006	Retrospective cohort, low intensity behavioral (Lovaas) vs. eclectic (alternative communication, TEACCH, sensory-motor, ABA)	Behavioral: 12 hrs/wk Eclectic: not specified	Behavioral: 20 mos Eclectic: 21 mos	Behavior group had mixed outcomes on cognitive measures (better on some measures, no diff on others), better communication scores, fewer problem behaviors. no diff in adaptive scores MIXED
Reed 2007	Retrospective	ABA: mean 30	Not specified	27 diff outcomes measures

Author	Study Design	Intervention Intensity	Intervention Duration	Summary of Outcome
	cohort, ABA vs. special nursery vs. portage (parent training)	hrs/wk Special nursery: mean 12 hrs/wk Portage: mean 8 hrs/wk		reported on, no sig diffs on 18. ABA group had better scores than one or the other of the comparators for the following measures: 2 of 3 overall ratings, 4 of 8 communication scores, 3 of 7 behavior scores. There were no diffs in motor skills scores, cognitive scores, comorbidities MIXED

In summary, the intensity of experimental interventions ranged from less than two hours per week to 40 hours per week. For the control interventions, intensity was often not specified, but was as high as 34 hours per week. Of those studies showing a mostly positive outcome for the intervention, intensity ranged from 26 to 40 hours per week, with the exception of the Stahmer study, which was a very narrowly focused intervention aimed at teaching parents a specific skill.

With regard to duration, five studies did not specify the length of the intervention period. The shortest study was 12 weeks, while the longest was 3 years. Of those studies showing a mostly positive outcome for the intervention, duration ranged from no more than a year to three years, with the exception of the Stahmer study.

The following limitations of the evidence were noted by the report authors:

“A high proportion of studies in this review (36 percent) fail to use a comparison group, and while substantial strides have been made in the analysis of single-subject designs, these are not ideal for assessing effectiveness at a population level, nor are they appropriate for comparative effectiveness research. They are, however, used frequently in the behavioral literature, and so we address our decisions regarding them here. Because there is no separate comparison group in these studies they would be considered case reports (if only one child included) or case series (multiple children) under the rubric of the EPC study designs. Case reports and case series can have rigorous evaluation of pre- and post- measures, as well as strong characterization of the study participants.

Studies using this design that included at least 10 children were included in the review. Studies of this type can be helpful in assessing response to treatment in very short time frames and under very tightly controlled circumstances, but they typically do not provide information on longer term or functional outcomes. They

are useful in serving as demonstration projects, yielding initial evidence that an intervention merits further study, and, in the clinical environment, they can be useful in identifying whether a particular approach to treatment is likely to be helpful for a specific child. Our goal was to identify and review the best evidence for assessing the efficacy and effectiveness of therapies for children with ASD, with an eye toward their utility in the clinical setting, and for the larger population of children with ASD. By definition, “populations” in single-subject design studies are likely to be idiosyncratic and therefore not to provide information that is generalizable.

Nonetheless, even in studies with a comparison group, sample size is frequently insufficient to draw conclusions, and larger, multisite trials are needed across all treatment types. Furthermore, the choice of comparison groups in the studies that employed a group design was uneven. A number of studies used comparison groups that were inappropriate for observing group differences in treatment effect (e.g., comparing treatment in children with autism to the effects of the treatment in typically developing peers or to children with a different developmental disorder), and for those studies we could only use the pre-post case series data available in the group with autism, limiting the ability to comment on effectiveness.

We encourage investigators to provide adequate detail as they describe their interventions to allow for replicable research. In ideal circumstances, investigators publish and reference treatment manuals, but many studies made general references to their use of an underlying approach (e.g., ABA) without specifying the ways in which they used the technique or modifications they made to the original, published use of it. Lack of detail about the intervention makes it difficult to assess the applicability of individual studies, to synthesize groups of studies or to replicate studies.

Characterization of the study population was often inadequate, with 125 of 159 studies failing to use or report “gold standard” diagnostic measures (clinical DSM-IV-based diagnosis plus ADI-R and/or ADOS) for the participants. Because ASDs are spectrum disorders, it is difficult to assess the applicability of interventions when the population in which they were studied is poorly defined or described. Authors often do not consider diagnostic criteria in selecting participants for their studies; nor do they fully describe the children who do participate. We recommend that investigators fully describe participants in their study, both diagnostically and otherwise. In addition, because the myriad causes of ASDs are unknown, even children with the same diagnosis may have distinct genetic or other “causes” that could affect treatment effectiveness. Ideally, future research will better characterize participants genotypically and phenotypically.

We identified more than 100 distinct outcome measures used in this literature base, not accounting for subscales. The use of so many and such disparate outcome measures makes it nearly impossible to synthesize the effectiveness of the interventions, and we recommend a consistent set of rigorously evaluated outcome measures specific to each intended target of treatment to move comparative effectiveness research forward and to provide a sense of expected outcomes of the interventions. At the same time, the means for assessing outcomes should include increased focus on use of observers or reporters masked to the intervention status of the participant, and where some outcomes are measured in a masked fashion but others not, more emphasis should be placed on those that are.

There also was a strong tendency for authors to present data on numerous outcomes without adjusting for multiple comparisons, and to fail to report the outcome that was the primary outcome of *a priori* interest and on which sample size calculations were based (when they were present). This may suggest a level of selective reporting bias in which results are published on a select group of outcomes that show the most effect. We attempted, but were unable, to identify a clear primary intended outcome in almost all of the papers.

Duration of treatment and follow up was generally short, with few studies providing data on long-term outcomes after cessation of treatment. Future studies should extend the follow up period and assess the degree to which outcomes are durable. Few studies adequately accounted for concomitant interventions that might confound observed effectiveness and this should be standardized in future research.” (Warren, 2012, p. 124-125)

[\[Evidence Source\]](#)

Surveillance of the literature pertaining to the Warren report was conducted by AHRQ in January 2012 and October 2012 (Maglione, 2012). Conclusions pertaining to ABA therapies that address the currency of the 2011 report are presented below:

- “Original conclusions regarding low strength of evidence for Early Intensive Behavioral Interventions (EIBI) are possibly out of date due to new RCTs and long-term follow-up of previously included studies.
- Original conclusion regarding insufficient evidence for parent training is possibly out of date due to several new RCTs.
- For Key Question 2 [what are the modifiers of outcome for different treatments or approaches (frequency, duration or intensity of treatment, characteristics of child or family, training of therapy provider)], conclusions are still valid, with the exception of impact of provider type, which may possibly be out of date.”

A total of 15 new studies identified in Maglione (2012) pertain to ABA and contributed to the conclusions above. The results of these studies are summarized below based on type of intervention. Conclusions regarding the impact of these new findings on the strength of evidence determinations of the Warren 2011 review are made by HERC members.

Seven studies evaluated EIBI (Maglione, 2012). Five of those were controlled trials, and the largest number of subjects was 142.

Table 2. Early Intensive Behavioral Interventions

Author	Study design	N	Intensity/Duration	Outcomes
Eikeseth 2012	Controlled clinical trial ³ (CCT). Setting was mainstream school. EIBI delivered by therapist without a degree supervised by psychologist with experience in ABA. Control group received one-on-one eclectic interventions provided by special education teacher 3-5 hrs/wk and had a teachers' aide assigned to work one-on-one 50-100% of time.	59	Mean 23 hrs/wk (range 15-37 hrs/wk) for treatment group; not specified for control. Duration: 1 year	EIBI group showed significant improvements in adaptive behaviors, maladaptive behaviors, and autism symptoms after one year of treatment and the gains continued into the 2 nd year
Eldevik 2012	CCT (Setting, intervention and control similar to above) – 2 yr follow-up	43	Mean 13 hrs/wk for a mean 25 mos	Children receiving EIBI had significantly higher IQ scores, adaptive behavior composite scores, communication and socialization
Flanagan 2012	CCT (treatment center vs. waitlist) chronological selection	142	Mean 26 hrs/wk for treatment, <10 hrs/wk waitlist with some speech and occupational therapy; mean duration 28 mos treatment, 17 mos waitlist	Children in the treatment group showed improved outcomes including lower severity of autism, higher adaptive functioning and cognitive skills (cognition not measured at onset of trial). Longer time in treatment controlled for in analysis.
Klintwall 2012	Case series ⁴ (mainstream	21	20 hrs/wk for 1 year	Children who had a larger repertoire of socially mediated

³ A type of clinical trial comparing the effectiveness of one medication or treatment with the effectiveness of another medication or treatment. In many controlled trials, the other treatment is a placebo (inactive substance) and is considered the "control" (AHRQ, n.d.).

⁴ A group or series of case reports involving patients who were given similar treatment. Reports of case series usually contain detailed information about the individual patients (NCI NIH, n.d.).

Author	Study design	N	Intensity/Duration	Outcomes
	kindergarten with EIBI by therapist at school)			and reinforced behaviors benefited more from treatment than children who demonstrated more stereotypical (or automatically reinforced) behaviors
Kovshoff 2011	CCT [clinic vs. parent-mediated (parents direct treatment/employ therapists) vs. treatment as usual (TAU)] – 2 yr follow up	41	Clinic: 17 hrs/wk parent-mediated: 24 hrs/wk Duration: 2 years	No differences in any outcome between EIBI vs TAU. Sub-group analysis found significantly better IQ and social behavior in parent-mediated group compared to clinic group or TAU. However, parent-mediated group had significantly less severe autism at baseline and received more hours of treatment.
Magiati 2011	Case series – 7 yr follow up	36	Mean 30 hours/wk for a mean of 58 mos	Increase in language skills, but at a lower rate than non-autistic peers
Strauss 2012	CCT [clinic with parental involvement vs. in-home (no parental involvement)]; self-selected	44	Mean 25 hrs/wk in a clinic setting 1 wk/mo and 19 hrs/wk provided by parents in the home 3 wks/mo after 3 wks of parent training for treatment group, mean 12 hrs/wk in-home treatment (eclectic) for control; Duration: 6 mos	Children receiving EIBI showed improvements in autism severity, developmental and language skills over 6 months. Control group that received eclectic treatment had improvements in some language and adaptive scores over that time period. While scores were generally higher in the treatment group, groups were not compared to each other statistically.

Overall, four of the five controlled trials found improved outcomes in children treated with EIBI, but one of these did not compare the intervention and control groups directly (Strauss, 2012). Intensity ranged from a mean of 13 to 26 hours/week. However, none of the trials were randomized and most were small, resulting in substantial susceptibility to bias. The overall strength of the evidence about the effectiveness of EIBI is likely unchanged.

Eight studies evaluated less intensive interventions that included parent training (Maglione, 2012).

Table 3. Less Intensive Behavioral Interventions including Parent Training

Author	Study design	N	Intensity/Duration	Outcomes
Goods 2012	RCT ⁵ [ABA + joint attention symbolic play engagement and regulation (JASPER) vs. ABA alone]	15	30 hrs/wk ABA both groups X 12 weeks. Intervention group substituted 30 min JASPER 2x/wk throughout program	Intervention group had greater play diversity, initiated more gestures and spent less time unengaged
Ingersoll 2010	RCT [reciprocal imitation training (RIT) delivered by therapists in clinic setting vs. TAU]	22	3 hr/wk RIT X 10 wks	RIT group made significantly more gains in elicited imitation and spontaneous imitation than the control group
Ingersoll 2011	Case series (parent training – Project IMPACT)	24	6 group and 6 individual coaching sessions over 4 mos	Children used a significantly higher rate of language during free play and home-based routine. Social impairment did not decrease significantly on parent report, but did on teacher report. Parents reported significantly less stress.
Kaale 2012	RCT (joint attention at preschool vs. preschool alone)	61	Two 20 min sessions (delivered by preschool teacher) 5 days/wk X 8 wks (mean 3.3 hrs/wk)	Intervention group showed significantly more joint attention with preschool teachers and longer duration of joint engagement with mothers
Kasari 2010	RCT (joint engagement instruction to parent vs. wait list) 1 yr follow up	38	24 sessions (~40 minutes) of parent instruction X 8 weeks (mean 2.0 hr/wk)	Greater improvements in 4 of 7 joint attention outcomes, maintained to 1 year
Landa 2011	RCT [Assessment, Evaluation and Programming System (AEPS) a type of EIBI curriculum vs. AEPS + Interpersonal Synchrony (IS)]	50	Classroom 2.5 hrs/day X 4 days/wk X 6 mos Home-based parent training 1.5 hrs/mo X 6 mos 38 hrs parent education follow up at 6 mos	No significant difference between groups in initiation of joint attention or shared positive affect, but the IS had significantly more socially engaged imitation than control
Minjarez 2011	Case series (pivotal response training taught to parents)	17	90 minute group session/wk for 10 wks + single 50 minute individual session	Primary outcome - child functional verbal utterances - increased significantly from baseline to week 10
Oosterling 2010	RCT [Focus parent training program (therapists as parent trainers, parents act as therapist to child) vs. usual care]	75	2 hrs/wk X 4 weeks followed by 3 hr home visit, repeated every 6 wks X 1 year (mean 1.8 hrs/week), same schedule	No significant effects of intervention on any outcome

⁵ A controlled clinical trial that randomly (by chance) assigns participants to two or more groups. There are various methods to randomize study participants to their groups (AHRQ, n.d.).

Author	Study design	N	Intensity/Duration	Outcomes
			but fewer home visits in second yr	

Of the six identified RCTs, two evaluated specific training programs within the setting of other ABA treatment (JASPER, IS) (Maglione, 2012). Of the remaining four trials, three found positive outcomes, although the interventions differed. One involved parent training to increase joint attention, one evaluated a joint attention intervention delivered by the teacher and the third evaluated RIT delivered by a therapist. The trial that did not show an effect on any outcome evaluated the Focus parent training program. Given the small sample sizes in most trials and the diversity in interventions, it seems likely that the overall strength of the evidence remains insufficient to accurately draw conclusions about the effectiveness of parent training programs.

Only one new study was identified that addresses Key Question 2 (Maglione, 2012). As noted above, Kovshoff (2011) compared clinic delivered and parent-mediated EIBI compared to treatment as usual. While subgroup analysis found significantly better IQ and social behavior in the parent-mediated group compared to the clinic delivered group or treatment as usual, the parent-mediated group had significantly less severe autism at baseline and received more hours of treatment. This suggests that the overall prior conclusions that there is insufficient strength of evidence to evaluate the impact of provider type on efficacy of the intervention remain valid.

[\[Evidence Source\]](#)

Parent-mediated Early Intervention

A more recent review of parent-mediated early intervention in children less than seven was completed by the Cochrane collaboration in April 2013 (Oono, 2013). It included 17 RCTs (one of which was identified in the AHRQ surveillance report, and eight of which were included in the original Warren report) and drew the following conclusions:

“Overall, we did not find statistical evidence of gains from parent-mediated approaches in most of the primary outcomes assessed (most aspects of language and communication - whether directly assessed or reported; frequency of child initiations in observed parent-child interaction; child adaptive behaviour; parents’ stress), with findings largely inconclusive and inconsistent across studies. However, the evidence for positive change in patterns of parent-child interaction was strong and statistically significant (shared attention: standardized mean difference (SMD) 0.41; 95% confidence interval (CI) 0.14 to 0.68, P value < 0.05; parent synchrony: SMD 0.90; 95% CI 0.56 to 1.23, P value < 0.05). Furthermore, there is some evidence suggestive of improvement in child language comprehension, reported by parents (vocabulary comprehension:

mean difference (MD 36.26; 95% CI 1.31 to 71.20, P value < 0.05). In addition, there was evidence suggesting a reduction in the severity of children's autism characteristics (SMD -0.30, 95% CI -0.52 to -0.08, P value < 0.05). However, this evidence of change in children's skills and difficulties as a consequence of parent-mediated intervention is uncertain, with small effect sizes and wide CIs, and the conclusions are likely to change with future publication of high-quality RCTs."

[\[Evidence Source\]](#)

Adolescents and Young Adults (Ages 13 to 30)

Only one poor quality case series evaluated ABA-based intensive behavioral therapy, precluding conclusions regarding efficacy in this age group (Lounds, 2012).

[\[Evidence Source\]](#)

Evidence Summary

Based on the evidence presented in this document (Warren, 2011; Maglione, 2012; Oono, 2013), there is low strength of evidence that EIBI improves the core symptoms of autism, although improvements are inconsistent. Parent-mediated early intervention does not clearly improve core autism measures, however, it likely results in improved shared attention and parent synchrony and language comprehension based on a low strength of evidence. The evidence is insufficient to evaluate the effectiveness of ABA on children and adolescents older than twelve. The evidence is insufficient to determine whether there are any factors that modify the effectiveness of ABA therapy.

GRADE-INFORMED FRAMEWORK

The HERC develops recommendations by using the concepts of the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system. GRADE is a transparent and structured process for developing and presenting evidence and for carrying out the steps involved in developing recommendations. There are four elements that determine the strength of a recommendation, as listed in the table below. The HERC reviews the evidence and makes an assessment of each element, which in turn is used to develop the recommendations. Balance between desirable and undesirable effects, and quality of evidence, are derived from the evidence presented in this document, while estimated relative costs, values and preferences are assessments of the HERC members.

Indication	Balance between desirable and undesirable effects	Quality of evidence*	Resource allocation	Values and preferences
EIBI for children aged 2 to 12 years at initiation	There is general evidence of benefit on communication, adaptive behavior, and overall autism severity	Low	High	Low variability
Other less intensive ABA-based treatments for children aged 2 to 12 at initiation	Parent delivered interventions under the direction of a trained therapist likely results in increased joint attention and parent synchrony, and possibly lessened overall severity of autism despite no clear benefit on language/communication, child adaptive behavior, or parent stress	Low	Moderate	Low variability
ABA for adolescents and young adults	Unknown	Insufficient	Moderate	Low variability

*The Quality of Evidence rating was assigned by the primary evidence source. The HERC has made its own assessment of the quality of the evidence after review of the studies contained within the AHRQ surveillance report.

Note: GRADE framework elements are described in Appendix A

SUMMARY CONCLUSIONS

Applied behavior analysis (ABA), including early intensive behavioral intervention (EIBI), is recommended for coverage⁶ for treatment of autism spectrum disorder⁷ in children ages 2-12 (*strong recommendation*).

Rationale: This strength of recommendation was based on sufficient (but low quality) evidence and expert input, including testimony on parent/caregiver values and preferences.

Parent/caregiver involvement and training is recommended to be a component of treatment (*strong recommendation*).

Rationale: Evidence and expert input indicated that parental involvement in ABA is a key part of effective treatment.

Initial coverage should be provided for up to six months. Ongoing coverage should be based on demonstrated progress towards meaningful objectives using a standardized, multimodal assessment, no more frequently than every six months (*strong recommendation*).

Rationale: Ensuring that patients are making meaningful progress is important to ensure quality outcomes and effective use of resources. The six month assessment was chosen based on expert input to allow for sufficient time for progress while not being burdensome to providers and plans.

In studies showing benefit, interventions ranged from less than two to 40 hours per week and had a duration of 10 weeks to three years. No specific minimum duration or intensity has been determined to be required for efficacy.

ABA is not recommended for coverage for treatment of autism spectrum disorder in persons over the age of 12 (*weak recommendation*).

Rationale: The evidence suggests that ABA is most effective when administered at younger ages, and there is insufficient evidence to support ABA treatment at older ages.

⁶ These conclusions apply to the Oregon Health Plan as governed by the Prioritized List of Health Services and to no other health plan.

⁷ Autism spectrum disorder should be diagnosed by a qualified health care professional according to DSM-5 criteria.

Note: The evidence for the treatment of conditions comorbid with autism spectrum disorder is beyond the scope of this evidence summary.

DRAFT

POLICY LANDSCAPE

No quality measures were identified when searching the [National Quality Measures Clearinghouse](#) pertaining to autism and applied behavioral analysis.

COMMITTEE DELIBERATIONS – EVIDENCE-BASED GUIDELINES SUBCOMMITTEE

COMMITTEE DELIBERATIONS – VALUE-BASED BENEFITS SUBCOMMITTEE

This report is prepared by the Health Evidence Review Commission (HERC), HERC staff, and subcommittee members. The evidence summary is prepared by the Center for Evidence-based Policy at Oregon Health & Science University (the Center). This document is intended to guide HERC in making informed decisions about the prioritization of health care services for the Oregon Health Plan.

The Center is not engaged in rendering any clinical, legal, business or other professional advice. The statements in this document do not represent official policy positions of the Center. Researchers involved in preparing this document have no affiliations or financial involvement that conflict with material presented in this document.

Appendix A. GRADE Element Descriptions

Element	Description
Balance between desirable and undesirable effects	The larger the difference between the desirable and undesirable effects, the higher the likelihood that a strong recommendation is warranted. The narrower the gradient, the higher the likelihood that a weak recommendation is warranted
Quality of evidence	The higher the quality of evidence, the higher the likelihood that a strong recommendation is warranted
Resource allocation	The higher the costs of an intervention—that is, the greater the resources consumed—the lower the likelihood that a strong recommendation is warranted
Values and preferences	The more values and preferences vary, or the greater the uncertainty in values and preferences, the higher the likelihood that a weak recommendation is warranted

Strong recommendation

In Favor: The subcommittee is confident that the desirable effects of adherence to a recommendation outweigh the undesirable effects, considering the quality of evidence, cost and resource allocation, and values and preferences.

Against: The subcommittee is confident that the undesirable effects of adherence to a recommendation outweigh the desirable effects, considering the quality of evidence, cost and resource allocation, and values and preferences.

Weak recommendation

In Favor: the subcommittee concludes that the desirable effects of adherence to a recommendation probably outweigh the undesirable effects, considering the quality of evidence, cost and resource allocation, and values and preferences, but is not confident.

Against: the subcommittee concludes that the undesirable effects of adherence to a recommendation probably outweigh the desirable effects, considering the quality of evidence, cost and resource allocation, and values and preferences, but is not confident.

Quality of evidence across studies for the treatment/outcome

High = Further research is very unlikely to change our confidence in the estimate of effect.

Moderate = Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low = Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low = Any estimate of effect is very uncertain.

Appendix B. Potentially Applicable Codes

CODES	DESCRIPTION
ICD-10 Diagnosis Codes	
F84.0	Autistic disorder
F84.2	Rett's syndrome
F84.3	Other childhood disintegrative disorder
F84.5	Asperger's syndrome
F84.8	Other pervasive developmental disorders
ICD-9 Volume 3 (Procedure Codes)	
None	
Procedure Codes	
<i>No specific procedure codes exist for Applied Behavior Analysis. The list below provides examples of how various state Medicaid agencies covering ABA instruct providers to bill.</i>	
H0002	Behavioral health screening to determine eligibility for admission to treatment program
H0004	Behavioral health counseling and therapy, per 15 minutes
H0031	Mental health assessment by non-physician
H0032	Mental health service plan development by non-physician
H2000	Comprehensive multidisciplinary evaluation
H2010	Comprehensive medication services, per 15 minutes
H2019	Therapeutic behavioral service, per 15 minutes
H2020	Therapeutic behavioral service, per diem
H2027	Psychoeducational service, per 15 min
T1023	Screening to determine the appropriateness of consideration of an individual for participation in a specified program, project or treatment protocol, per encounter
T1024	Evaluation and treatment by an integrated, specialty team contracted to provide coordinated care to multiple or severely handicapped children, per encounter
T1027	Family training and counseling for child development, per 15 min
T2013	Habilitation, educational, waiver, per hour
T2026	Specialized childcare, waiver, per diem

Note: Inclusion on this list does not guarantee coverage

Appendix C. HERC Guidance Development Framework

EIBI for Children Aged 2 to 12; Other Less Intensive ABA-based Treatments for Children Aged 2 to 12

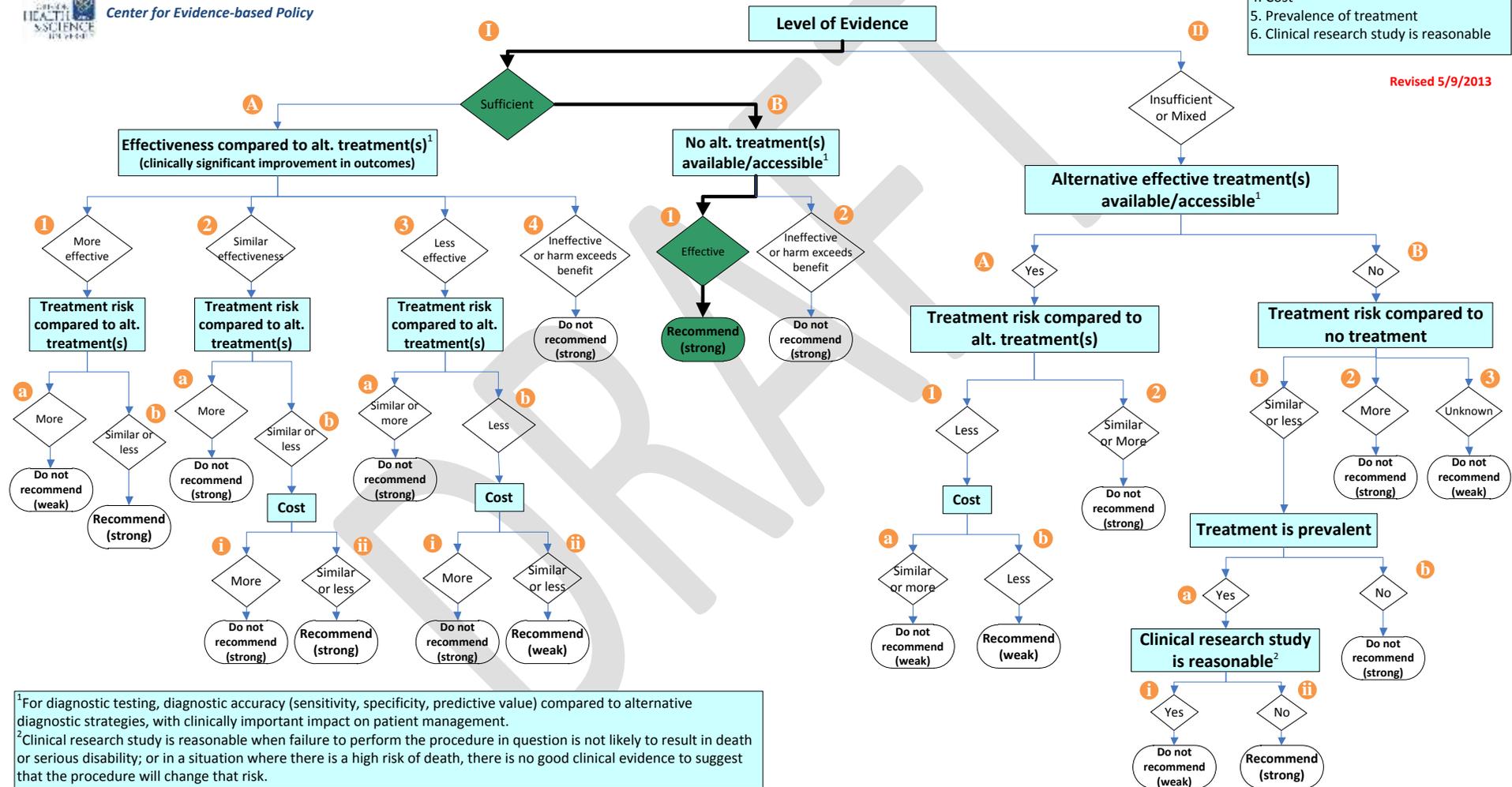


HERC Guidance Development Framework

Refer to HERC Guidance Development Framework Principles for additional considerations

- Decision Point Priorities**
1. Level of evidence
 2. Effectiveness & alternative treatments
 3. Harms and risk
 4. Cost
 5. Prevalence of treatment
 6. Clinical research study is reasonable

Revised 5/9/2013



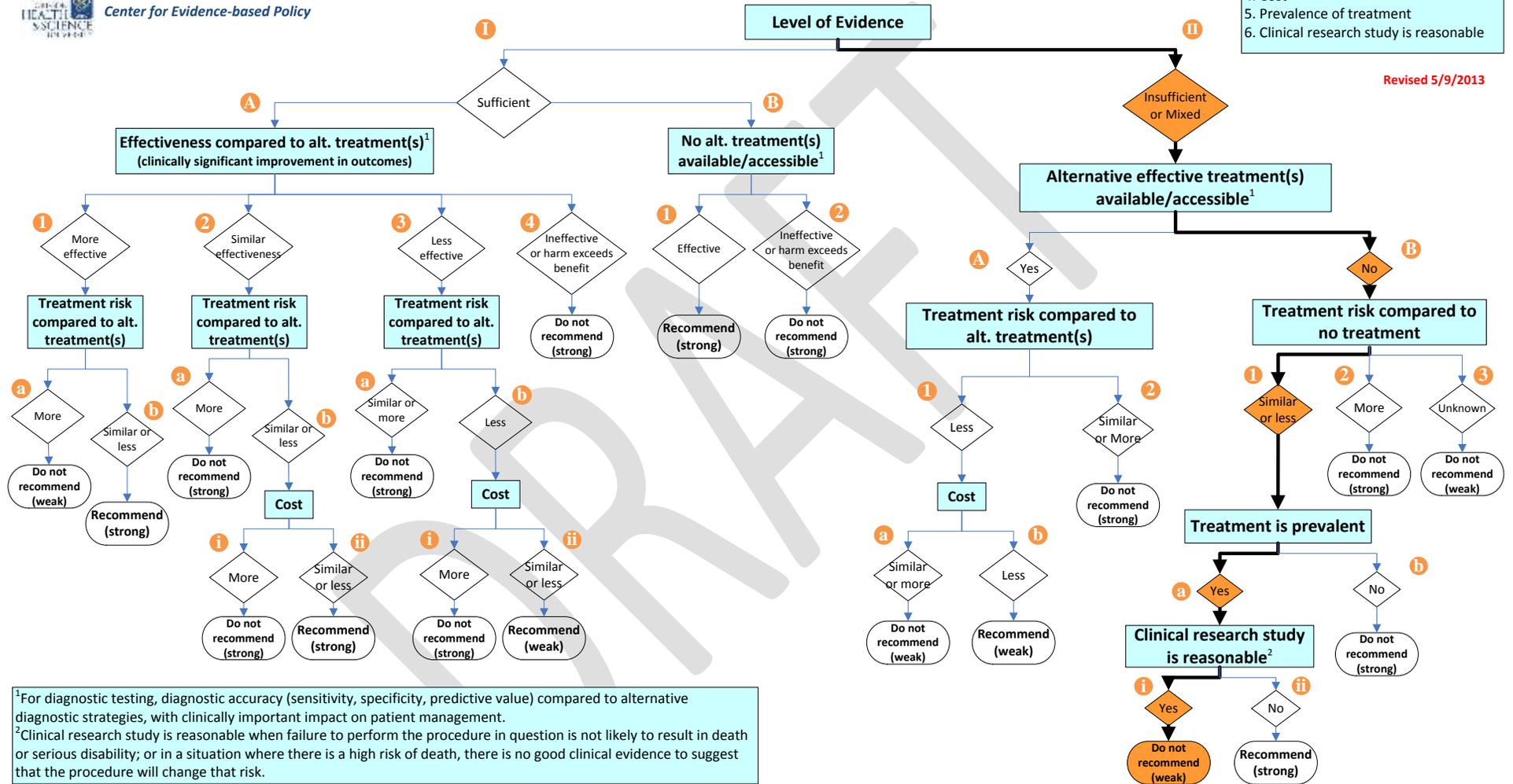
HERC Guidance Development Framework

Refer to *HERC Guidance Development Framework Principles* for additional considerations

- Decision Point Priorities**

 1. Level of evidence
 2. Effectiveness & alternative treatments
 3. Harms and risk
 4. Cost
 5. Prevalence of treatment
 6. Clinical research study is reasonable

Revised 5/9/2013



¹For diagnostic testing, diagnostic accuracy (sensitivity, specificity, predictive value) compared to alternative diagnostic strategies, with clinically important impact on patient management.
²Clinical research study is reasonable when failure to perform the procedure in question is not likely to result in death or serious disability; or in a situation where there is a high risk of death, there is no good clinical evidence to suggest that the procedure will change that risk.

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