WHO/HIV/2013.139

HIV and adolescents: guidance for HIV testing and counselling and care for adolescents living with HIV

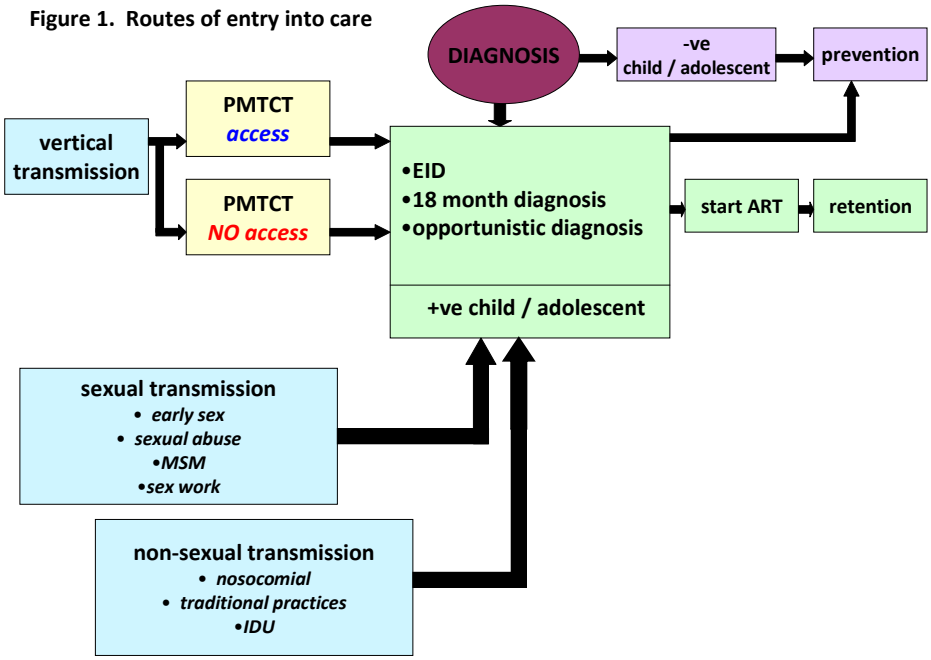
ANNEX 13: Adolescent ARV service delivery: a review of the literature

Introduction

A significant portion of the globe's HIV prevalence consists of adolescents, defined as the age group of 10-19 years, according to the World Health Organization.[1] In 2010, the total worldwide number of young people between the ages of 15-24 living with HIV was 5.0 million, with eastern and southern Africa containing 2.6 million; 42% of new HIV infections among adults in the same year occurred in this age range.[2]

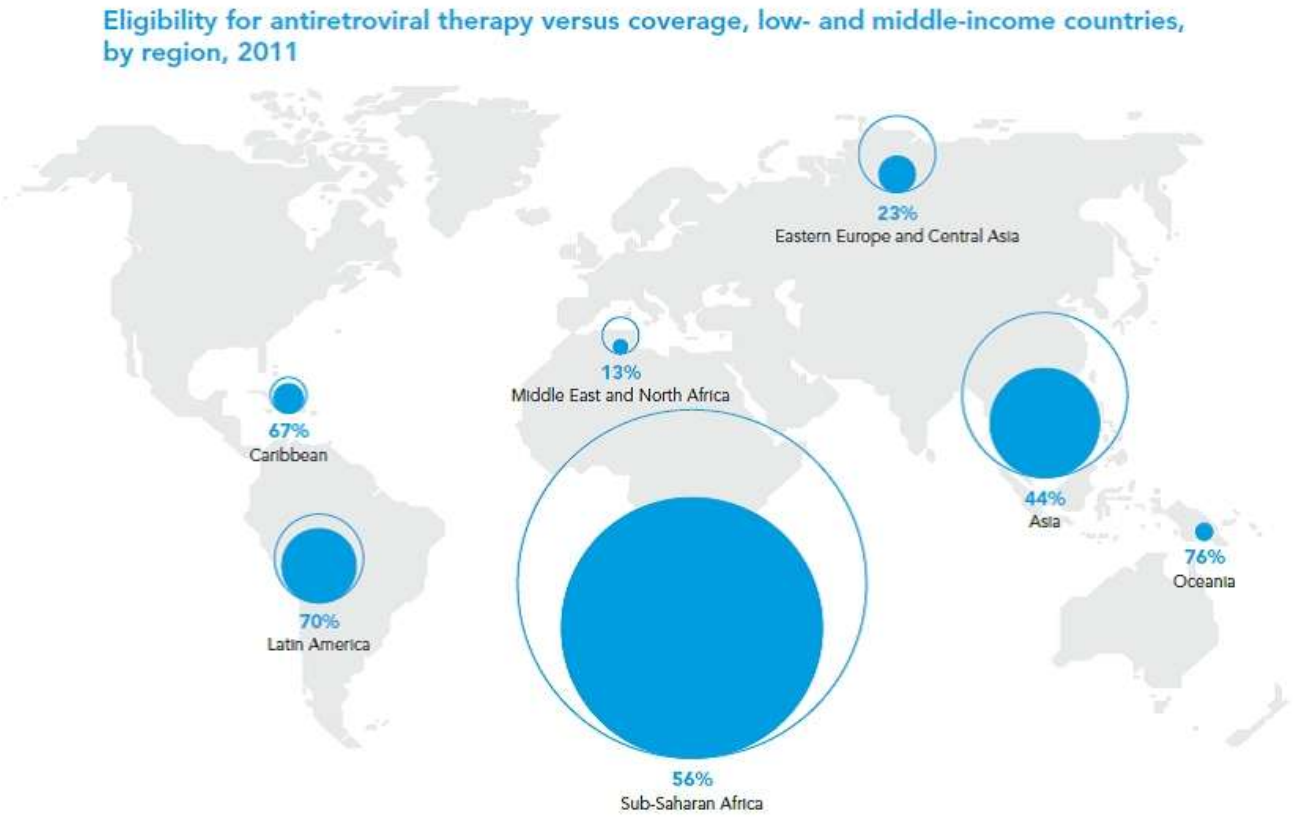
Adolescents may acquire HIV "vertically" through mother-to-child transmission (including breastfeeding); in this case, diagnosis may have been missed due to loss to follow up or else due to poor PMTCT (prevention of mother-to-child transmission) programs. Acquisition may also occur "horizontally"—either sexually or non-sexually, including intravenous drug use or medical transmission (figure 1).

Figure 1. Routes of entry into care



Globally, the number of children ages 0-14 receiving antiretroviral therapy (ART) in 2011 was 562,000; coverage was estimated to be 28% [25-32%].[3] Estimated coverage among adults was 57% [53-60%] worldwide and 54% [50-60%] within low- and middle-income countries, where 7 million [6.4-7.3 million] people eligible for antiretroviral (ARV) treatment are not receiving it. Figure 2 below reflects eligibility versus coverage in these countries (2011), as depicted by UNAIDS.

Figure 2.



The area in the larger circle represents the number of people eligible for antiretroviral therapy. The shaded circle and percentage represent coverage in 2011.

By increasing ARV coverage and adherence among adolescents, HIV morbidity and mortality may be reduced. Despite the large number of adolescents with HIV, however, research tailored to this particular age group is very limited, and yet the particular needs of this population differ from those of younger children and adults. The development of WHO guidelines on adolescent HIV service delivery addresses a crucial gap in the current treatment efforts. The guideline development is most effectively supported by a systematic review aiming to explore the following questions:

- What are the current antiretroviral service delivery models for adolescents?
- What are adolescents' attitudes towards service delivery?
- What are the existing barriers to entering and remaining in ARV care? What are the existing barriers to adhering to ARV treatment?
- What factors facilitate ARV care entry and retention? What factors facilitate adherence to ARV treatment?

Methods

A systematic review of published literature was conducted using PubMed (including MEDLINE), EMBASE (Excerpta Medica), the Cochrane systematic reviews, New York Academy of Grey Literature, and OpenSIGLE; the search method employed combinations of terms for adolescents, HIV, care, and services.

Search terms

Search	
	Search (("2002/10/01"[Date - Entrez] : "2012/10/06"[Date - Entrez])) AND (HIV AND (care OR service OR services) AND (adolescents OR young people OR youth))

Inclusion Criteria

Studies were considered eligible for inclusion based on the following criteria:

1. Studies may include randomized controlled trials, observational studies, case reports, expert opinion pieces.
2. Unpublished studies and studies published in non-English languages journals were considered for inclusion.
3. Studies must include discussion or reports of youth between the ages of 10-24 years old.
4. Studies considered eligible for inclusion must pertain to one of the following topics:
    - Description, comparison or evaluation of existing ART service models
    - Evaluation of outcome measures and the impact of various ART care approaches
    - Adolescent attitudes towards ART care services
    - Barriers to ART care entry and retention; characteristics associated with low care entry and retention
    - Barriers to ART adherence; characteristics associated with poor adherence
    - Facilitators to ART care entry and retention; characteristics associated with high care entry and retention
    - Facilitators to ART adherence; characteristics associated with good adherence

5. Articles published or unpublished reports prepared and entered into the databases between October 2002 and October 2012 were included in the review. No other limitations were used.

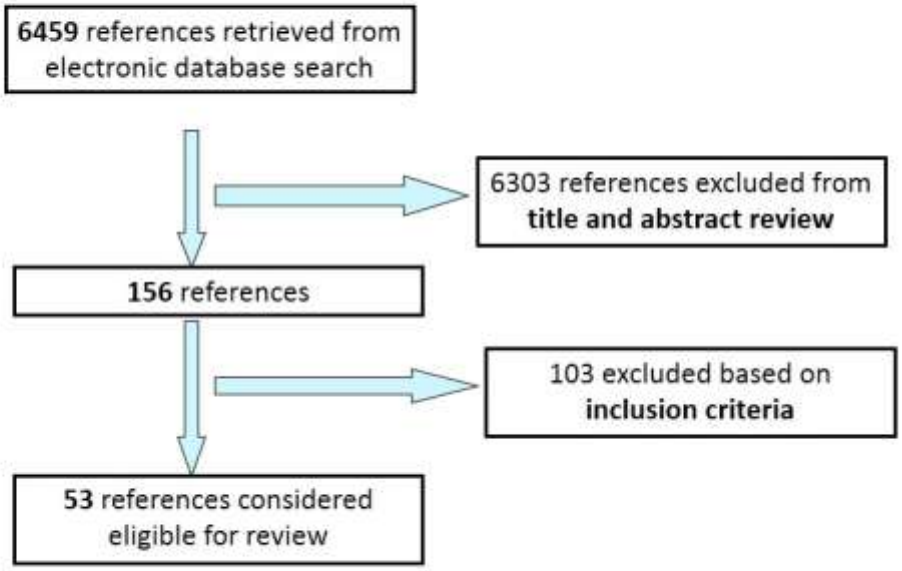
Data Extraction

Article data was extracted and organized into a table by topic, study design, income level, population factors (including sample size), intervention (if applicable), comparator (if applicable), outcome measures (including available p-values and odds ratios), main conclusions, article limitations, and studies were ranked. The ranking of studies rated the quality of the evidence on a scale of 1-4 (4 representing highest quality) by study design: 4 = RCTs; 3 = quasi-experimental, involving a comparison group; 2 = descriptive, no comparison group; 1 = reviews, case studies, grey literature.

Results

The literature search retrieved 6459 references. Of these 6459 references, 6303 were excluded following title and abstract review. Of the remaining 156, a further 103 were excluded based on retrieval of the full paper and based on inclusion criteria. 53 references remained eligible and were included in the review (figure 3).

Figure 3. Inclusion flow diagram



Description of Included Studies

Table 1 presents the frequencies of study characteristics found in references included in the review. The majority of studies were descriptive (55%), and only two out of the 53 studies included were randomized controlled trials. 83% (44) of the studies were conducted in high income countries while 2% (one study) were conducted in middle income countries and 15% (8 studies) in low income countries. Topics containing zero studies in either middle or low income countries were "Attitudes to services" and "Barriers to care entry & retention"; these topics also contained the least amount of studies overall (one and six, respectively).

Table 1. Frequencies of Study Characteristics

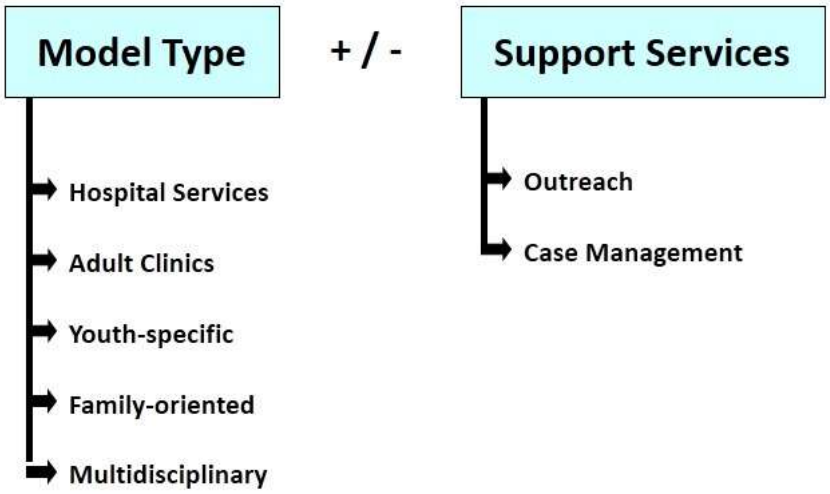
		STUDY DESIGN				INCOME LEVEL		
		Randomized Controlled Trials	Quasi-Experimental	Descriptive Studies	Reviews, Cases, Grey Lit			
TOPIC	REFERENCES	(4)	(3)	(2)	(1)	High	Med	Low
Service Models	7	0	0	4	3	5	0	2
Attitudes to Services	1	0	0	1	0	1	0	0
Barriers to Care Entry & Retention	6	0	0	4	2	6	0	0
Barriers to ART Adherence	21	0	3	13	5	17	1	3
Facilitators to Care	17	1	4	6	6	16	0	1
Facilitators to ART Adherence	14	1	5	7	1	11	0	3
TOTAL*= *(rounded % estimate of all references included)*	53 *(100)*	2 *(4)*	12 *(23)*	29 *(55)*	12 *(23)*	44 *(83)*	1 *(2)*	8 *(15)*

**The total numbers do not correspond to the sum of the above figures; some references could be categorized under more than one topic.*

Models of ARV Treatment Services

Several different model types were either described or mentioned in the findings, any of which may or may not have included the additional use of support services: outreach, mental health, case management (figure 4). Only those studies provided description of model types with or without support services are discussed in this review and included in the study characteristics figures.

Figure 4. Models of ARV Treatment Services



Youth-specific

Woods describes a youth-oriented collaborative care network of 2116 12-24 year olds in Boston.[4] The program, called "Boston HAPPENS," utilizes a range of care approaches all catered to youth. Three primary agencies are identified: 1) multiservice outreach agencies which included street outreach, walk-in care, mobile vans and services providing basic food/clothing/shelter needs; 2) multidisciplinary, community-based health centers providing a variety of health care services (HIV, reproductive, mental health and substance abuse services in addition to support services such as outreach, youth development programs, and case management); and 3) hospitals offering youth both medical and mental health care, including adolescent clinics, HIV case management and specialty care. The program was designed to provide accessible, multidisciplinary, integrative and "client-focused" care to youth.

An outpatient adolescent HIV clinic in Kampala, managed by the Baylor-Uganda Children's Foundation, had been a development from a needs assessment at the pediatric infectious disease clinic at Mulago Hospital, according to Kumar.[5] The clinic cares for more than 800 HIV-positive youth (ages 12-24) mostly infected through vertical transmission. Psychosocial support also accompanies the sexual and reproductive health services offered. The same author also identified another youth-oriented HIV program called "HEAT" (Health and Education Alternatives for Teens), located in New York. The program offers support services along with comprehensive medical care for HIV-infected and at-risk 13-24 year olds.

"The Special Adolescent Clinic" (SAC) is university-based in the USA and consists of HIV-positive youth between the ages of 14-25 years, most of whom are African American or Hispanic and who had acquired HIV sexually.[6] A "one-stop shopping" multidisciplinary approach is used, combining various medical and psychosocial services together in the same location.

"The Adolescent, Women and Children" (AWAC) treatment programs young people with HIV, also based in the USA, are designed to minimize adolescent barriers to effective care; they also employ a multidisciplinary approach addressing medical, nutritional, substance use, mental and social health needs.[7] An additional case management system helped to facilitate the efforts to overcome adolescent barriers to care.

Family-oriented

A nonprofit organization called "Caring for Haitian Orphans with AIDS" demonstrates a family-oriented care model in Haiti for orphans with AIDS, ages 5-16.[8] HIV-positive women are hired to be live-in caretakers for the children in a small house located in a "regular neighborhood" that provides a sense of community. CHOAIDS also attends to nutrition, safe water, social, psychological and educational needs of children in addition to monthly medical checkups and ARV medications.

Multidisciplinary

Most of the models already identified had also incorporated multidisciplinary approaches which have already been described above.[4,6,7,8]

UNICEF supports a hospital in Rwanda ("Rwinkwavu") where 570 children are part of the pediatric HIV program; in addition to ARV medication, patients visit monthly peer support clubs and receive education, thereby simultaneously addressing social and educational needs.[9]

Support Services

Support services, including outreach and the use of case management, were common adjuncts to many of the models previously discussed.[4,5,7]

Woods elaborates in a different article on the outreach component of the Boston HAPPENS program, where 56% of participants had received outreach services as their first contact (including street and telephone outreach).[10]

Adolescent Attitudes towards ARV Care Services

Only one article was identified in this search pertaining to adolescent attitudes towards ARV care services. Seven 16-22 year olds were interviewed in the UK regarding their experiences in transitioning from pediatric to adult HIV care services.[11] The transition was perceived to be "easy" by four out of the seven subjects; three may have possibly delayed their transition due to concerns regarding coordination of HIV and hemophiliac care and also due to fear of the adult environment. Those with had not been very involved in their own care decisions experienced more positive feelings towards transition; those who had been more involved and had developed more pediatric staff attachment expressed more sad feelings about transition and sense of relational loss.

Barriers to Care Entry and Retention

Possible adolescent barriers to ARV care entry and retention include the following (table 2):

Therapeutic

- Complex medical routine
- Drug / alcohol use

Structural

- Transportation
- Housing / food, clothing
- Have children
- No insurance

Psycho-Emotional

- Mental health, depression, anxiety
- Denial of diagnosis
- Patient autonomy level

Social

- Fear of adult patients
- Stigma
- Difficulty legging go of pediatric caregiver

Table 2. Barriers to Care Entry & Retention *(page 1 of 2)*

	Author	Study Type ±	Age, Sample Size [N]	Country	Quantitative Outcome
Therapeutic					
Complex medical routine	Gilliam[12]	2	13-25 yrs discussed, *[N = 19 clinic workers]*	USA	NA
Drug / alcohol use	Martinez[13]	2	15-24 yrs, *[N = 107]*	USA	14% (N=19) perceived need for drug/alc Rx
Structural					
Transportation	Martinez[13]	2	15-24 yrs, *[N = 107]*	USA	40.2% (N=43) perceived need for transportation
Housing / food, clothing	Martinez[13]	*(see above)*			46.7% (N=50) perceived need for housing
	Minniear[14]	2	13-21 yrs, *[N = 202]*	USA	Delayed entry into HIV care associated with unstable residence: RR: 1.5*
Have children	Minniear[14]	*(see above)*			More likely to fail to remain in HIV care (controlled for sex): RR: 1.8*
No insurance	Minniear[14]	*(see above)*			More likely to fail to remain in HIV care (despite access to free care): RR: 2.8*
Psycho-Emotional					
Mental health, depression, anxiety	Gilliam[12]	2	13-25 yrs discussed, *[N = 19 clinic workers]*	USA	NA
	Martinez[13]	2	15-24 yrs, *[N = 107]*	USA	44.9% (n=48) perceived mental health needs
Denial of diagnosis	Martinez[13]	*(see above)*			NA
	Johnson[15]	1	13-18 yrs, *[N = NA]*	USA	NA
Patient autonomy level	Andiman[16]	1	13-24 yrs, *[N = NA]*	USA	NA
	Vijayan[17]	2	12-24 yrs, *[N = 18]*	USA	NA

Table 2 cont. Barriers to Care Entry & Retention *(page 2 of 2)*

	Author	Study Type ±	Age, Sample Size [N]	Country	Quantitative Outcome
Social					
Fear of adult patients	Gilliam[12]	2	13-25 yrs discussed, *[N = 19 clinic workers]*	USA	NA
Stigma	Gilliam[12]	*(see above)*			NA
	Vijayan[17]	2	12-24 yrs, *[N = 18]*	USA	NA
Difficulty letting go of pediatric caregiver	Vijayan[17]	*(see above)*			NA
	Andiman[16]	1	13-24 yrs, *[N = NA]*	USA	NA
	Gilliam[12]	2	13-25 yrs discussed, *[N = 19 clinic workers]*	USA	NA

± 4=Randomized Control Trial, 3=Quasi-Experimental, 2=Descriptional, 1=Review / grey literature
** p<0.05*
NA=Not applicable

Barriers to ART Adherence

Possible adolescent barriers to ART adherence include the following (table 3):

Therapeutic

- Difficult med routine / too many pills
- Adverse side effects
- Regimen fatigue
- Drug / alcohol use

Structural

- Schedule / daily routine complications
- Unstable home
- Full-time job
- Don't carry an extra dose of ARV meds
- Was taught how to take meds by a health worker
- Too few pediatric HIV care practitioners
- Consent

Knowledge

- Poor understanding of dosage importance

Psycho-Emotional

- Psychological struggles, depression
- Reminder of disease
- Denial
- Feel / appear well
- Forgot
- Not concerned about ART
- Persistent belief that "HIV is God's punishment"
- Refused
- Self-destructive coping mechanism

Social

- Low trust of healthcare provider
- Stigma

Table 3. Barriers to ART Adherence *(page 1 of 3)*

	Author	Study Type ±	Age, Sample Size [N]	Country	Quantitative Outcome
Therapeutic					
Difficult med routine / too many pills	Chandwani[18]	3	13-18 yrs, *[N = 104]*	USA	Assoc'dd with non-adherence: AOR: 1.84*
	Belzer[19]	2	13-24 yrs, *[N = 31]*	USA	46% reported as reason for missing meds
Adverse side effects	Belzer[19]	2	13-24 yrs, *[N = 31]*	USA	29% reported as reason for missing meds
	Macdonell[20]	2	16-24 yrs, *[N = 186]*	USA	"Situational temptation score": 2.86-2.97 / 5
	Murphy[21]	2	12-19 yrs, *[N = 159]*	USA	NA
	Andiman[16]	1	13-24 yrs, *[N = NA]*	USA	NA
Regimen fatigue	Merzel[22]	2	10-16 yrs (subjects of discussion), *[N = 30 caregivers]*	USA	NA
Drug / alcohol use	Dietz[23]	2	13-24 yrs, *[N = 178]*	USA	Marijuana use assoc'd with missed appts: RR: 0.87*
	Macdonell[20]	2	16-24 yrs, *[N = 186]*	USA	"Situational temptation score": 2.42 out of 5
Structural					
Schedule complications	Belzer[19]	2	13-24 yrs, *[N = 31]*	USA	25% reported as reason for missing meds
	Macdonell[20]	2	16-24 yrs, *[N = 186]*	USA	"Situational temptation score": 2.37 out of 5
	Murphy[21]	2	12-19 yrs, *[N = 159]*	USA	NA
Unstable home	Andiman[16]	1	13-24 yrs, *[N = NA]*	USA	NA
Full-time job	Song[24]	3	13-24 yrs, *[N = 208]*	USA	***No*** full-time job associated with attending intervention sessions: OR: 2.12*
Don't carry extra dose	Filho[25]	2	10-19 yrs, *[N = 101]*	Brazil	Associated with non-adherence: OR: 6.63*
Was taught how to take meds by health worker	Filho[25]	*(see above)*			Associated with non-adherence: OR: 0.27*
Too few pediatric HIV care practitioners	American Acad of Pediatrics[26]	1	0-18 yrs, *[N = NA]*	USA (refers to developing countries)	NA
Consent	Binagwaho[27]	1	10-19 yrs, *[N = NA]*	Rwanda	NA
	Strode[28]	1	0-18 yrs, *[N = NA]*	So. Africa	NA
	Ho[29]	1	15-29 yrs, *[N = NA]*	USA	NA

Table 3 cont. Barriers to ART Adherence *(page 2 of 3)*

	Author	Study Type*	Age, Sample Size [N]	Country	Quantitative Outcome
Knowledge					
Poor understanding of dosage importance	Abadia-Barrero[30]	2	1-15 yrs, *[N = 50]*	Brazil	NA
Psycho-Emotional					
Psychological struggles, depression	Andiman[16]	1	13-24 yrs, *[N = NA]*	USA	NA
	Murphy[31]	2	13-18 yrs, *[N = 161]*	USA	Depressed subjects less likely to identify & take all of meds: OR: 0.2 (p<0.001)
	Murphy[21]	2	12-19 yrs, *[N = 159]*	USA	NA
	Belzer[19]	2	13-24 yrs, *[N = 31]*	USA	15% reported as reason for missing meds
Reminder of disease	Belzer[19]	*(see above)*			32% reported as reason for missing meds
	Vijayan[17]	2	12-24 yrs, *[N = 18]*	USA	NA
Denial	Andiman[16]	1	13-24 yrs, *[N = NA]*	USA	NA
Feel / appear well	Abadia-Barrero[30]	2	1-15 yrs, *[N = 50]*	Brazil	NA
	Vijayan[17]	2	12-24 yrs, *[N = 18]*	USA	NA
Forgot	Buchanan[32]	2	8-18 yrs, *[N = 120]*	USA	49% of 12-18 year olds reported "forget" as a barrier
	Belzer[19]	2	13-24 yrs, *[N = 31]*	USA	22% reported as reason for missing meds
	Chandwani[18]	3	13-18 yrs, *[N = 104]*	USA	Associated with missing doses: AOR: 2.53*
	Macdonell[20]	2	16-24 yrs, *[N = 186]*	USA	"Situational temptation score": 2.45 out of 5
	Trocme[33]	2	13+ yr adols, *[N = 29]*	France	23/29 interviewed reported either forgetting or refusing
Not concerned about ART	Filho[23]	2	10-19 yrs, *[N = 101]*	Brazil	Associated with non-adherence: OR 3.47*
Persistent belief that HIV is God's punishment	Lyon[34]	3	14-21 yrs, *[N = 38]*	USA	Assoc'd with worse adherence*
Refused	Merzel[22]	2	10-16 yrs (subjects of discussion), *[N = 30 caregivers]*	USA	NA
	Trocme[33]	2	13+ yr adols, *[N = 29]*	France	9/29 interviewed reported refusing
	Andiman[16]	1	13-24 yrs, *[N = NA]*	USA	NA
Self-destructive coping	Song[24]	3	13-24 yrs, *[N = 208]*	USA	Inversely assoc'd with attending intervention sessions: b= -3.22 (p<0.01)

Table 3 cont. Barriers to ART Adherence *(page 3 of 3)*

	Author	Study Type*	Age, Sample Size [N]	Country	Quantitative Outcome
Social					
Low trust of healthcare provider	Andiman[16]	1	13-24 yrs, *[N = NA]*	USA	NA
Stigma	Andiman[16]	*(see above)*			NA
	Belzer[19]	2	13-24 yrs, *[N = 31]*	USA	18% reported as reason for missing meds
	Rao[35]	2	17-25 yrs, *[N = 25]*	USA	50% reported skipping doses for fear of status disclosure among family or friends
	Vijayan[17]	2	12-24 yrs, *[N = 18]*	USA	NA
	Martinez**[36]	***2***	***15-24 yrs, [N = 178 females]***	***USA***	***Insignificant*** predictor

± 4=Randomized Control Trial, 3=Quasi-Experimental, 2=Descriptional, 1=Review / grey literature
** p<0.05*
*****Stigma was found to NOT be a barrier to ART adherence***
NA=Not applicable

Facilitators to Care Entry and Retention

Possible adolescent facilitators to ARV treatment care include the following (table 4):

Model Characteristics

- Treatment sites should *NOT* be HIV-specific
- Youth-specific
- Multidisciplinary / comprehensive
- Support services (outreach, case management)
- Variety of care sites
- Continuous

Linkage to care

- HIV test provider links youth to care
- Coordinator assists with pediatric-to-adult HIV care transition
- Pediatric case manager follows up after pediatric-to-adult HIV care transition

Knowledge

- Disclosure of HIV status to adolescent

Social

- Family-centered
- Peer support
- Relationship-building with healthcare workers
- Diversity-sensitive staff
- Youth independence is nurtured by staff

Table 4. Facilitators to Care Entry & Retention *(page 1 of 2)*

	Author	Study Type ±	Age, Sample Size [N]	Country	Quantitative Outcome
Model Characteristics					
Treatment sites should NOT be HIV-specific	Martinez[13]	2	15-24 yrs, *[N = 107]*	USA	NA
Youth-specific	Wohl[37]	3	18-24 yrs, *[N = 61]* *(Latino & Afr-Amer MSM)*	USA	90% of youth-focused management group were retained in care at 3 mo.s & 70% at 6 mo.s; care attendance increased 7%→73% *
	Johnson[15]	1	13-18 yrs, *[N = NA]*	USA	NA
	Davila[38]	3	13-23 yrs, *[N = 174]*	USA	Adequate visit constancy improved 31% →57% after specifying services to youth (with case managers)*
	Gilliam[12]	2	13-25 yrs, *[N = 19 clinic workers who discussed youth]*	USA	NA
Multidisciplinary / comprehensive	Gilliam[12]	*(see above)*			NA
	Johnson[15]	1	13-18 yrs, *[N = NA]*	USA	NA
	Major-Wilson[6]	1	Adolescents, *[N = NA]*	USA	NA
	Palmer[39]	1	Adolescents, *[N = NA]*	USA	NA
	Woods[4]	2	12-24 yrs, *[N =2116]*	USA	NA
	Woods[10]	2	12-24 yrs, *[N = 2116]*	USA	NA
	Woods[40]	1	Adolescents, *[N = NA]*	USA	NA
	Chandwani[41]	4	13-21 yrs, *[N = 2116]*	USA	83.3% of multimodal behavioral intervention group attended ≥ half the sessions (p=0.5)
Support services (outreach, case management)	Davila[38]	3	13-23 yrs, *[N = 174]*	USA	Visit constancy improved 31% → 57% after specifying services to youth with case managers
	Gilliam[12]	2	13-25 yrs discussed, *[N = 19 clinic workers]*	USA	NA
	Hightow-Weidman[42]	3	17-24 yrs, *[N = 81]* *(Black MSM)*	USA	63% of support services intervention retained in care at 3 yrs; OR 2.58 for clinic attendance*
	Wohl[37]	3	18-24 yrs, *[N = 61]* *(Latino & Afr-Amer MSM)*	USA	90% of a youth-focused case management group were retained in care at 3 mo.s & 70% at 6 mo.s; care attendance increased 7%→73% *
	Harris[43]	2	12-24 yrs, *[N = 1426]*	USA	Longer retention with ≥2 outreach contacts or case management at ≥3 visits

Table 4 cont. Facilitators to Care Entry & Retention *(page 2 of 2)*

	Author	Study Type*	Age, Sample Size [N]	Country	Quantitative Outcome
Model Characteristics continued					
Variety of care sites	Woods[4]	2	12-24 yrs, *[N = 2116]*	USA	NA
	Woods[10]	2	12-24 yrs, *[N = 2116]*	USA	NA
Continuous	Woods[4]	2	12-24 yrs, *[N = 2116]*	USA	NA
	Woods[10]	2	12-24 yrs, *[N = 2116]*	USA	NA
	Johnson[15]	1	13-18 yrs, *[N = NA]*	USA	NA
Linkage to Care					
HIV test provider links to care	Hightow-Weidman[44]	2	13-24 yrs, *[N = 334 males]*	USA	Earlier linkage associations: test provider refers to care*; calls to make appointment (p<0.01)
	Jeanjacques[45]	1	12-24 yrs, *[N = NA]*	USA	NA
	Johnson[15]	1	13-18 yrs, *[N = NA]*	USA	NA
	Woods[4]	2	12-24 yrs, *[N = 2116]*	USA	NA
	Woods[40]	1	Adolescents, *[N = NA]*	USA	NA
Transition coordinator assists with ped-to-adult HIV care	Kumar[46]	1	10-24 yrs, *[N = NA]*	USA	NA
	Gilliam[12]	2	13-25 yrs discussed, *[N = 19 clinic workers]*	USA	NA
Pediatric case manager F/U after ped-to-adult care transition	Gilliam[12]	*(see above)*			NA
Knowledge					
Disclosure of HIV status to adolescent	Arrive[47]	3	10-21 yrs, *[N = 6501]*	Cote d'Ivoire, Mali, Senegal	Associated with higher care retention: aHR: 0.23 (p<0.0001)
Social					
Family-centered	Palmer[39]	1	Adolescents, *[N = NA]*	USA	NA
Peer support	Hightow-Weidman[42]	3	17-24 yrs, *[N = 81]* *(Black MSM)*	USA	63% of support services intervention including peer support retained in care at 3 yrs; OR 2.58 for clinic attendance*
	Johnson[15]	1	13-18 yrs, *[N = NA]*	USA	NA
Relationship-building with healthcare workers	Johnson[15]	*(see above)*			NA
	Woods[40]	1	Adolescents, *[N = NA]*	USA	NA
	Martinez[13]	2	15-24 yrs, *[N = 107]*	USA	NA
Diversity-sensitive staff	Gilliam[12]	2	13-25 yrs discussed, *[N = 19 clinic workers]*	USA	NA
Independence nurtured	Kumar[46]	1	10-24 yrs, *[N = NA]*	USA	NA

± 4=Randomized Control Trial, 3=Quasi-Experimental, 2=Descriptional, 1=Review / grey literature
** p<0.05*
NA=Not applicable

Facilitators to ART Adherence

Possible adolescent facilitators to ART adherence include the following (table 5):

Therapeutic

- Simpler med routine / lower viral load

Model Characteristics

- Family-centered, community-based
- Directly-observed therapy

Technology

- Cell phone reminders
- Web-based training program

Knowledge

- Disclosure of HIV status to adolescent
- Open communication / education in a supportive context
- Health literacy

Psycho-Emotional

- Adjustment
- Effective coping mechanisms

Social

- Family support
- Peer support
- Specific med-taking strategies discussed with youth

Table 5. Facilitators to ART Adherence *(page 1 of 2)*

	Author	Study Type ±	Age, Sample Size [N]	Country	Quantitative Outcome
Therapeutic					
Simpler med routine / lower viral load	Machado[48]	2	10-19 yrs,*[N = 96]*	Brazil	Sig. diifference in good adherence between monotherapy (56%) & double drug therapy (21%) patients*
Model Characteristics					
Family-centered, community based	Letourneau[49]	4	9-17 yrs, *[N = 34]*	USA	Sig. adherence increase after intervention: OR 1.24*
Directly-observed therapy	Gaur[50]	3	16-25 yrs, *[N = 20]*	USA	Self-reported adherence over study period: >93% in all 6 "DOT successes" until week 16; only 3 sustained adherence off DOT until wk 24
Technology					
Cell phone reminders	Dowshen[51]	3	14-29 yrs, *[N = 25]*	USA	Sig. increase in mean visual analog scale scores: 74.7 (week 0) → 93.3 (week 12)* → 93.1 (week 24)*
	Puccio[52]	3	16-24 yrs, *[N = 8; 5 completed study]*	USA	Total med doses missed out of 5 pt.s: Post 4 wks: 1 Post 8 wks: 4 Post 12 wks: 6
Web-based training program	Shegog[53]	3	14-22 yrs, *[N = 10]*	USA	Sig. self-efficacy increases for taking meds right time every day; taking meds correctly even if travelling or busy at work, school, or at a party; and getting family & friends' help in remembering*
Knowledge					
Disclosure of HIV status to adolescent	Merzel[22]	2	10-16 yrs, *[N = 30 caregivers]*	USA	NA
	Andiman[16]	1	13-24 yrs, *[N = NA]*	USA	NA
Open communication / education in support house	Abadia-Barrero[30]	2	1-15 yrs, *[N = 50]*	Brazil	NA
Health literacy	***Murphy**[54]***	***2***	***16-24 yrs, [N = 186]***	***USA***	***Insignif.*** association

Table 5 cont. Facilitators to ART Adherence *(page 2 of 2)*

	Author	Study Type ±	Age, Sample Size [N]	Country	Quantitative Outcome
Psycho-Emotional					
Adjustment	Michaud[54]	2	13-20 yrs *[N = 29, including 22 females]*	Switzerland	NA
Effective coping mechanisms	Michaud[54]	2	13-20 yrs *[N = 29, including 22 females]*	Switzerland	NA
	Song[24]	3	13-24 yrs, *[N = 208]*	USA	Social support coping associated with intervention attendance: OR: 1.58 (p<0.006) Spiritual coping mechanism associated with intervention attendance: b=1.27 (p<0.010)
Social					
Family support	Davey[55]	2	14-24 yrs, *[N = 50]*	USA	NA
	Hodgson[56]	2	10-19 yrs, *[N = 170]* *(includes 59 informants not in age bracket)*	Zambia	NA
Peer support	Hodgson[56]	*(see above)*			NA
	Merzel[22]	2	10-16 yrs, *[N = 30 caregivers]*	USA	NA
Specific med-taking strategies discussed with youth	Michaud[54]	2	13-20 yrs *[N = 29, including 22 females]*	Switzerland	NA

± 4=Randomized Control Trial, 3=Quasi-Experimental, 2=Descriptional, 1=Review / grey literature
** p<0.05*
*****Health literacy NOT a facilitator to ART***
NA=Not applicable

Discussion

Although there is urgent need to increase ARV coverage among the adolescent population, there is relatively little published literature to guide how this goal should be achieved in a way that is acceptable and effective. There are some significant findings, however, which emerge out of the findings in this review.

Documentation of current model types was very limited. Most current documentation pertains to youth-specific care, multidisciplinary care, and the addition of support services. There were no studies eligible for this review which documented links to other services such as TB, IDU, and antenatal clinics; links to reproductive health services did, however, make themselves evident in a couple of findings. Data related to adolescent attitudes towards care was even more scant, as this review only uncovered one such study.

General categories of barriers to care entry and retention included: therapeutic, structural, psychoemotional, and social; barriers to ART adherence fell within the same general categories with the addition of a "knowledge" category. General categories of facilitators to care included: model characteristics, linkage to care, knowledge, and social; facilitators to ART included the same categories, apart from the linkage category, and also included "therapeutic," "technology," and "psycho-emotional categories.

Limitations

As the quality and aims of studies were variable and limited to our inclusion criteria, some inherent challenges in synthesizing and interpreting the data subjected this review to several limitations. While 53 references were identified for the inclusion in this review, only two of these studies were randomized controlled trials, which increased the difficulty in systematically comparing and summarizing data which hold differing degrees of quality of evidence; quasi-experimental studies were additionally limited at 12 studies total. Furthermore, there is a limited number of studies focusing on the particular age range of 10-19 years; some information pertaining to this age range may have been missed in this review since those studies which are also inclusive of much younger or older age ranges without age segregation data were excluded from this analysis. And although a systematic method was used for reference inclusion and data extraction, selection bias is also a possible limitation in this review due to the inevitable element of subjective judgment. Finally, publication bias may have affected data collected and conclusions drawn in this review.

Nonetheless, the strength of the evidence used in this review has been qualified according to several elements such as study design, location, sample size, and statistical significance. Evidence may be substantially devoid of support from randomized control trials, however where the evidence shows consistency and strength of associations is where the general trends reported may be relied upon. The review methodology is transparent and repeatable, and resources other than peer-reviewed publications were also included in the review (i.e., regional databases, grey literature, newspapers, and speeches).

Conclusion

This review offers an overview of the current literature on adolescent ARV service delivery. This overview primarily supports the elimination of barriers and the promotion of facilitators to ARV care entry and retention as well as ARV adherence; by doing so, adolescent ARV coverage may be increased, thereby reducing adolescent HIV morbidity and mortality.

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