Outpatient HIV care in the Netherlands

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Structure and quality of outpatient care for people living with an HIV infection.

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Chapter 2. Review

Abstract
Policy makers and clinicians are faced with a gap of evidence to guide policy on standards for HIV outpatient care. Ongoing debates include which settings of care improve health outcomes, and how many HIV-infected patients a healthcare provider should treat to gain and maintain expertise. In this article, we evaluate the studies that link healthcare facility and care provider characteristics (i.e. structural factors) to health outcomes in HIV-infected patients. We searched the electronic databases MEDLINE, PUBMED and EMBASE from inception until 1 January, 2015. We included a total of 28 observational studies that were conducted after the introduction of combination antiretroviral therapy in 1996. Three aspects of the available research linking the structure to quality of HIV outpatient care were evaluated: (1) assessed structural characteristics (i.e. healthcare facility and care provider characteristics); (2) measures of quality of HIV outpatient care; and (3) reported associations between structural characteristics and quality of care. Rather than scarcity of data, it is the diversity in methodology in the identified studies and the inconsistency of their results that led us to the conclusion that the scientific evidence is too weak to guide policy in HIV outpatient care. We provide recommendations on how to address this heterogeneity in future studies and offer specific suggestions for further reading that could be of interest for clinicians and researchers.
Introduction
The availability of combination antiretroviral therapy (cART) has resulted in remarkable decreases in HIV-related morbidity and mortality. Unfortunately, the complexity of the management of HIV infection has grown along with the advances in treatment. Individuals infected with HIV face a lifetime of treatment with cART and monitoring of disease progression. Healthcare providers are confronted with challenges related to cART including toxicities, drug-drug interactions and drug resistance, and comorbidities among the aging HIV-positive population.

In order to achieve optimal health outcomes, care for HIV-infected patients should be provided at healthcare facilities and by care providers with sufficient expertise. Previous studies have evaluated the impact of healthcare facility and care provider characteristics on the quality of care for HIV-infected patients. However, questions regarding qualifications to treat HIV-infected patients remain. Ongoing debates include which settings of care (e.g. primary/secondary/tertiary facilities; facility volume) improve health outcomes, and how many HIV-infected patients a healthcare provider should treat (provider HIV caseload) to gain and maintain expertise.

The first studies addressing these issues took place before the introduction of cART. Studies showed lower rates of mortality in facilities with greater volumes of HIV-infected inpatients and in facilities with units dedicated to HIV/AIDS care. In addition, greater clinician HIV experience was positively associated with survival. With the advent of cART, the focus shifted from measurement of survival to assessment of virologic success and physician adherence to guidelines. Studies showed that patients treated by healthcare providers with more training/expertise in HIV/AIDS care had greater plasma viral load control and were more likely to be on cART. Currently, there are a growing number of studies assessing care delivery models and interventions in outpatient HIV care. The aims of the interventions, as well as the way they are operationalized, are very diverse. "Adherence support", "case management", "task shifting" and "integration of care" are examples of widely studied interventions. They are beyond the scope of this review and have been reviewed separately elsewhere.

In this article we give an overview of the scientific literature linking healthcare facility and care provider characteristics to the quality of HIV outpatient care. It is the first to focus exclusively on studies that took place after the introduction of cART. We used the structure-process-outcome framework to distinguish between the characteristics and outcomes that have been evaluated. Structure refers to stable characteristics of health systems (e.g. staff and facility volume). Process describes the activities of care providers and patients in healthcare. Outcome refers to the effects of care on the health status of patients.
Chapter 2. Review

We aim to provide a critical evaluation of three aspects of the available research linking the structure to quality of HIV outpatient care: (1) assessed structural characteristics (i.e. healthcare facility and care provider characteristics); (2) measures of quality of HIV outpatient care; and (3) reported associations between structural characteristics and quality of care. For this third part of the review, we focused exclusively on studies that measured virologic success.

Methods

We searched the electronic databases MEDLINE, PUBMED and EMBASE from the dates of their inception until 1 January, 2015, using the search terms presented in box 1. Titles, abstracts, and full text studies were screened. Reference lists of relevant studies were screened for additional relevant citations. In order to be eligible, articles had to report an original observational research study with an adult HIV-infected population. We excluded studies that (i) were conducted before the introduction of cART in 1996 or (ii) focused exclusively on interventions, due to the great variety in their aims and operationalization.

We extracted general parameters (study design, country, and population); structural characteristics on the health facility level (setting, volume, specialisation, level of care, and disciplines in care team), and characteristics on the healthcare provider level (caseload, training and experience). We distinguished clinical outcome measures (HIV RNA levels, mortality, AIDS events, CD4 cell counts, and other) and process outcome measures (cART exposure; hepatitis B and C, tuberculosis (TB), and cervical cancer screening; Pneumocystis jiroveci pneumonia (PCP) prophylaxis; vaccination for influenza and hepatitis B; monitoring of CD4 cells; and other). Finally, we extracted patient reported outcome measures (PROMs) and measures of adherence, retention in care, and care utilization.

Findings from the literature review were grouped into: (1) structural characteristics; (2) quality of care outcome measures; and (3) reported associations between structural characteristics and the quality of care. During the search process we found a big variation in health outcome measures. This complicated summarization and comparison of studies. We therefore performed a final selection and only evaluated associations among studies that measured virologic success, as this was the most consistently used outcome measure.

Results

Our search strategy identified 770 potentially relevant citations. Forty additional citations were identified through manual screening of the references. We excluded 751 citations after screening of titles and abstracts (not relevant, measured inpatient mortality or had a study period in the pre cART era). We retrieved 59 articles for full text screening. Subsequently, 31 articles were excluded because they were only descriptive or focused exclusively on interventions or patient characteristics.
In total, 28 articles were included. The majority were retrospective cohort (n=12)\textsuperscript{12, 20-30} or cross-sectional studies (n=7).\textsuperscript{31-37} One had a prospective cohort design,\textsuperscript{38} and eight studies did not explicitly state their design strategy. Most of the studies had taken place in the USA (n=12),\textsuperscript{12, 21, 23, 25, 26, 30, 31, 33, 34, 36, 37, 39} and countries in sub-Saharan Africa (n=13).\textsuperscript{20, 22, 24, 27-29, 32, 40-45} The remaining studies were situated in Brazil,\textsuperscript{46} India,\textsuperscript{35} and Canada.\textsuperscript{38} (Figure 1).
Structural factors

The most commonly evaluated health facility characteristic (Table 1) was number of HIV-infected patients in care (‘facility volume’, n=7). Facility volume was generally defined as the number of HIV-infected patients in outpatient care. The number of categories and definitions varied: four categories: <25; 25–99; 100–299; and >300 patients; three categories: <15; 16–100; and 101–500 or <100; 100–500; and >500 patients; and two categories: <950 and >950 patients. The number of beds and number of outpatient visits per year were also used to define facility volume. Other health facility characteristics of interest were specialisation and team composition. Facilities that only treated patients with Sexually Transmitted Diseases (STD) and HIV infection, or that were regarded as a “specialised HIV practice” by the medical director, were defined as specialised facilities. Studies focusing on team composition assessed the presence of a clinical pharmacist with specialisation in HIV disease, and treatment team diversity (7 categories based on the number of disciplines).

Table 1. Summary of assessed structural characteristics (n=28)

<table>
<thead>
<tr>
<th>Structural characteristics</th>
<th>References (countries)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>health facility characteristics</strong></td>
<td>21, 30-32, 37, 43, 46 (Brazil, Cameroon, South Africa, USA)</td>
</tr>
<tr>
<td>Facility volume (number of patients in care).</td>
<td>37, 46 (Brazil, USA)</td>
</tr>
<tr>
<td>Facility specialisation (exclusively treating HIV patients).</td>
<td>20, 22, 24, 27, 28, 31, 32, 35, 41, 42, 44, 45 (Cameroon, Ethiopia, India, Kenya, Malawi, South Africa, Other countries in SSA)</td>
</tr>
<tr>
<td>Health facility setting: including private vs public funding,</td>
<td>33, 39 (USA)</td>
</tr>
<tr>
<td>level of care, community-based vs hospital care and urban vs</td>
<td></td>
</tr>
<tr>
<td>rural setting.</td>
<td></td>
</tr>
<tr>
<td><strong>HIV care team composition</strong></td>
<td>12, 20, 25, 29, 36, 37, 39 (Ethiopia, Mozambique, USA)</td>
</tr>
<tr>
<td>Healthcare provider expertise: specialisation/training.</td>
<td>12, 26, 36-38 (USA, Canada)</td>
</tr>
<tr>
<td>Healthcare provider expertise: HIV experience/caseload.</td>
<td>34 (USA)</td>
</tr>
<tr>
<td>Other characteristics (self-reported cultural competence).</td>
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</table>

Abbreviations: SSA, sub-Saharan Africa.

Thirteen studies evaluated the setting of the healthcare facility. These studies assessed the impact of private versus public funding, level of care (primary/secondary/tertiary; hospital/clinic; or centralized/decentralized) and location of care site (urban/rural). The most commonly evaluated healthcare provider characteristic was HIV-specific specialisation (n=7). The studies generally compared the performance of infectious disease specialists versus expert generalists and non-expert generalists. In addition, the quality of care provided by non-physician clinicians (nurse practitioners and physician assistants) was assessed. HIV-related experience was another commonly studied provider characteristic.
Experience was expressed in terms of number of HIV-infected patients previously treated by, or the number of patients currently under the care of the healthcare provider (provider HIV caseload). One study assessed self-reported cultural competence (CC) of healthcare providers. Interventions to improve CC (the ability to understand and respect values, attitudes, and beliefs that differ across cultures) have gained attention, particularly in high income countries with diverse population groups.

Measures of quality of care

Table 2 shows that the most frequently used clinical outcome measures were virologic success (n=11) and mortality (n=9). Virologic success was generally defined as one undetectable HIV RNA measurement with a threshold ranging from 50 to 500 copies/ml. A minority of studies looked at two consecutive measurements, or specified a time period after the initiation of cART. Other studies measured time to viral suppression. Mortality was assessed after a specific follow-up time or during the entire study period. Changes in mean CD4 cell count, average monthly gain, and the proportion of patients with CD4 cells <200 cells/mm$^3$ were used to define immunological success. Additional clinical outcomes were side effects (clinical diagnosis related to first-line treatment) and number of drug-resistant mutations.

The most common process measure was cART exposure among eligible patients (n=9). cART eligibility depended on the guidelines used by the health facility. Time on cART was also used to measure quality of care. One study assessed processes that are not directly HIV-related in the measurement of quality of care. In this study, safety laboratory assessments were measured (≥3 complete blood count and serum creatinine measurements, and liver function tests). In addition, HIV-related primary care measures were included (annual lipid assessments, annual fasting glucose, and baseline hepatitis A, B and C laboratory assessment).

One study used (unstandardized/unvalidated) PROMs to measure quality of care. Patient satisfaction was measured with one question. Number of “unmet needs” (income assistance, housing, home healthcare, counselling, and drug/alcohol treatment), perceived access to care and patient trust and willingness to recommend care were also assessed.

Retention in care was assessed by measuring loss to follow up (LTFU, n=9). Most of the studies defined LTFU as absence from treatment for at least 3 months after the last missed appointment date. In two studies, failed attempts at tracking the patients was included in the definition of LTFU. The two remaining outcomes were care utilization and adherence to cART. Adherence in the previous 3 or 4 days was measured with standardized questionnaires. In two of these studies, treatment interruptions in the 4 preceding weeks were also assessed. One study used pharmacy refill data in the 180 days after starting cART to measure adherence.
Table 2. Summary of most assessed quality of care measures (n=28)

<table>
<thead>
<tr>
<th>Quality of care measures</th>
<th>Operationalization and definitions</th>
<th>References (countries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinical outcomes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virologic success</td>
<td>Predominantly one HIV RNA measurement, with or without a specified period of time after cART initiation. Thresholds ranging from 50–500 copies/ml.</td>
<td>12, 21, 23, 24, 33-36, 38, 43, 44 (Canada, India, Malawi, South Africa, USA)</td>
</tr>
<tr>
<td>Mortality</td>
<td>Mortality after 12 or 24 months follow-up, death during study period.</td>
<td>20, 22, 24, 26, 27, 40, 43-45 (Ethiopia, Kenya, Malawi, Nigeria, South Africa, USA)</td>
</tr>
<tr>
<td>Immunologic success</td>
<td>Mean CD4-cell change (gains of 100 cells/µL with periods ranging from 12 to 24 months after starting cART, average monthly CD4-cell gain.</td>
<td>20, 23, 25, 33, 41, 44 (Cameroon, Ethiopia, Malawi, USA)</td>
</tr>
<tr>
<td>Other clinical outcomes</td>
<td>Side-effects, number of drug resistant mutations.</td>
<td>22, 35 (India, Malawi)</td>
</tr>
<tr>
<td>Process measures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cART exposure</td>
<td>Rates cART exposure among eligible population, time on cART.</td>
<td>12, 21, 25, 30, 36, 37, 39, 42, 45 (Kenya, Other countries in SSA, USA)</td>
</tr>
<tr>
<td>PCP prophylaxis</td>
<td>Rates of appropriate prophylaxis.</td>
<td>12, 21, 25, 30, 36, 39 (USA)</td>
</tr>
<tr>
<td>TB, hepatitis B, hepatitis C, cervical cancer screening</td>
<td>Rates of screening (among eligible population).</td>
<td>12, 21, 25, 30, 36, 39 (USA)</td>
</tr>
<tr>
<td>CD4-cell count</td>
<td>Rates and frequency, depending on followed guidelines.</td>
<td>21, 25, 29, 30 (Mozambique, USA)</td>
</tr>
<tr>
<td>Influenza vaccination</td>
<td>Rates of vaccination.</td>
<td>12, 36 (USA)</td>
</tr>
<tr>
<td>HBV vaccination</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other process measures</td>
<td>Laboratory measurements (complete blood cell count, creatinine, ALT or AST, Cholesterol, Glucose); syphilis screening; MAC prophylaxis; measurement of HIV RNA; quality improvement interventions; service levels (composite score).</td>
<td>21, 25, 30, 31, 46 (Brazil, USA)</td>
</tr>
<tr>
<td>Patient satisfaction with care</td>
<td>Rating based on one question.</td>
<td>39 (USA)</td>
</tr>
<tr>
<td>Other PROMs</td>
<td>Problem Index score, number of unmet needs, perceived access to care, ‘7 items patient trust’, interpersonal quality of care, willingness to recommend care.</td>
<td>39 (USA)</td>
</tr>
<tr>
<td>Loss to follow-up (retention in care)</td>
<td>Predominantly: absence from outpatient clinic for at least 3 months after the last missed appointment date.</td>
<td>20, 22, 24, 27-29, 40, 43, 45 (Ethiopia, Kenya, Malawi, Mozambique, Nigeria, South Africa)</td>
</tr>
<tr>
<td>Care utilization</td>
<td>Primary care, specialty care and emergency room visits, hospitalization, home health visit, outpatient visits in 3 or 4 quarters.</td>
<td>12, 26, 29, 36, 39 (Mozambique, USA)</td>
</tr>
<tr>
<td>Adherence</td>
<td>Pharmacy refill compliance data, self-reported adherence (VAS), ‘mean adherence rate’.</td>
<td>29, 32, 34, 41 (Cameroon, Mozambique, USA)</td>
</tr>
</tbody>
</table>

Abbreviations: ALT, alanine aminotransferase; AST, aspartate aminotransferase; cART, combination antiretroviral therapy; HBV, hepatitis B virus; MAC, Mycobacterium avium complex; PCP, Pneumocystis jiroveci pneumonia; SSA, sub-Saharan Africa; TB, tuberculosis; VAS, visual analogue scale.
**Associations between structural factors and quality of care**

A total of 11 studies were included in the assessment of structural characteristics associated with quality of HIV outpatient care (Table 3). Two of the studies showed an association between facility volume and the likelihood of achieving viral suppression. In the first study, patients from large facilities (>300 patients in care) were more likely to achieve viral suppression than patients from small facilities.\(^{21}\) In the second study, based in South Africa, rates of viral suppression were lower in large care sites (>950). This association only applied to the first 12 months after starting cART.\(^{43}\)

In three studies, a positive association was found between physician expertise and virologic success. Two studies used a composite variable with three levels of expertise: infectious disease physicians, expert generalists and non-expert generalists. Physicians were asked whether they considered themselves to be specialists in HIV ("experts").\(^{12,36}\) A significant association between current HIV caseload (an increase of 100 patients in care) and viral suppression was found in one study,\(^{38}\) and not found in another (categories: <19; 20–299; and >300 patients in care).\(^{12}\) In one study assessing performance by non-physician clinicians, rates of viral suppression among patients treated by nurse practitioners and physician assistants were similar to that of those treated by infectious disease-trained physicians and generalist HIV experts. Moreover, the rates of viral suppression among patients treated by the non-physician clinicians were higher than that of those treated by generalist non-HIV experts.\(^{36}\)

Four studies focused on health facility setting. There was no difference in virologic success among patients in care in centralized (hospital based) versus decentralized (community-based) facilities (USA and Malawi).\(^{23,44}\) In one study, patients treated in private health facilities were more likely to have treatment failure compared to patients in public/public-private health facilities (India).\(^{35}\) This also applied to patients in district/regional hospitals versus primary healthcare facilities (South Africa).\(^{24}\)

Finally, provider CC (assessment of cultural skills)\(^{34}\) and the involvement of a clinical pharmacist in HIV outpatient care\(^{33}\) were positively associated with viral suppression.

**Discussion**

In this review, we evaluate the studies that have investigated the impact of healthcare facility and care provider characteristics on health outcomes in HIV outpatient care. We point out a number of findings that are of particular importance when interpreting the results of the identified studies.

First, a disproportionate amount of studies is based in the USA and in countries in sub-Saharan Africa, making it difficult to generalize findings to other parts of the world (Figure 1). Another important finding involves the diversity in choice and definition of structural variables across the different studies. This makes it difficult to summarize results and translate the results into practice.
## Table 3. Summary of fully reviewed studies (n=11)

<table>
<thead>
<tr>
<th>Author, year (reference)</th>
<th>Study design, population</th>
<th>Investigated factors</th>
<th>Outcome HIV RNA*</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Backus, 2010 (21)</strong></td>
<td>RCS; 73 sites; 21,564 veterans; USA</td>
<td>Facility volume: &lt;25; 25–99; 100–299; &gt;300 patients in care</td>
<td>&lt;400</td>
<td>Patients from care sites with smaller numbers of HIV-infected patients in care (&lt;300) were less likely to have HIV RNA control.</td>
</tr>
<tr>
<td><strong>Chu, 2010 (23)</strong></td>
<td>RCS; 423 patients; USA</td>
<td>Health facility setting: hospital based specialty centre vs community based primary care network</td>
<td>&quot;Undetectable&quot;</td>
<td>No significant differences in the likelihoods of achieving viral suppression (16–32 weeks after starting cART) between patients from community based vs. hospital care sites.</td>
</tr>
<tr>
<td><strong>Fatti, 2010 (24)</strong></td>
<td>RCS; 59 sites; 29,203 cART naïve patients; South Africa</td>
<td>Health facility setting: primary healthcare facilities vs district hospitals vs regional hospitals</td>
<td>&lt;400</td>
<td>Patients from district and regional hospitals were less likely to have viral suppression than patients in care at primary healthcare facilities.</td>
</tr>
<tr>
<td><strong>Fatti, 2011 (43)</strong></td>
<td>RCS; 54 sites; 4,0861 cART-naive patients; South Africa</td>
<td>Facility volume: &lt;950 or &gt;950 patients in care</td>
<td>&lt;400</td>
<td>Patients from care sites with smaller numbers of HIV-infected patients in care were more likely to achieve viral suppression within 12 months of starting cART. No significant differences in the proportion of patients achieving viral suppression at all time points.</td>
</tr>
<tr>
<td><strong>Horberg, 2007 (33)</strong></td>
<td>CSS; 14 sites; 1,571 patients; USA</td>
<td>Team composition: HIV clinical pharmacists</td>
<td>&lt;500</td>
<td>Patients exposed to a HIV clinical pharmacist were more likely to achieve viral suppression at 12 months.</td>
</tr>
<tr>
<td><strong>Landon, 2005 (12)</strong></td>
<td>RCS; 64 sites; 5,247 patients; USA</td>
<td>Healthcare provider expertise: Infectious disease specialists vs expert generalist vs non-expert generalist; and current caseload: low (0–19), medium (20–299), or high (&gt;300 patients)</td>
<td>&lt;600</td>
<td>Patients treated by Infectious disease specialists were most likely to have a controlled viral load, followed by expert generalists and non-expert generalists. No significant differences in viral suppression between patients with physicians with low, medium or high caseloads.</td>
</tr>
<tr>
<td><strong>McGuire, 2012 (44)</strong></td>
<td>CSS; 1 hospital vs 10 rural health sites; 702 patients; Malawi</td>
<td>Health facility setting: centralised vs decentralised.</td>
<td>&lt;50</td>
<td>No significant differences in viral suppression (one year after starting cART) between patients followed at centralised and decentralised facilities.</td>
</tr>
<tr>
<td><strong>Saha, 2013 (34)</strong></td>
<td>CSS; 4 sites; 45 providers; 437 patients, USA</td>
<td>Other healthcare provider characteristics: Self-rated cultural competence.</td>
<td>≤75</td>
<td>Greater racial disparity in viral suppression among patients with providers with a low cultural competence.</td>
</tr>
<tr>
<td><strong>Sangsari, 2012 (38)</strong></td>
<td>PCS; 267 drug users; Canada</td>
<td>Healthcare provider expertise - current caseload: number of patients enrolled in HIV registry</td>
<td>&lt;500</td>
<td>Patients treated by physicians with greater HIV experience were more likely to have viral suppression.</td>
</tr>
<tr>
<td><strong>Shet, 2011 (35)</strong></td>
<td>CSS; 471 patients; India</td>
<td>Health facility setting: public, private and public-private</td>
<td>&lt;100</td>
<td>Patients visiting public and public-private health facilities were more likely to have viral suppression compared to those in private settings.</td>
</tr>
<tr>
<td><strong>Wilson, 2005b (36)</strong></td>
<td>CSS; 68 sites; 6,651 patients; USA</td>
<td>Healthcare provider expertise: physician vs nurse practitioner/physician assistant</td>
<td>&lt;400</td>
<td>Patients treated by nurse practitioners and physician assistants were more likely to have viral suppression than those of non-expert generalists. Rates of viral suppression among patients treated by these non-physician clinicians were similar to those treated by infectious disease-trained physicians and expert generalists.</td>
</tr>
</tbody>
</table>

*Abbreviations: cART, combination antiretroviral therapy; ID, infectious diseases; CSS, cross-sectional study; PCS or RCS, prospective or retrospective cohort study*
A third key finding is the scope of measures of quality of care used in the studies. More than 20 outcomes were measured, with exact definitions often differing between studies (e.g. cART exposure and time on cART). Mortality was measured relatively often, evidently more often in low-resource countries. In contrast, screening of TB, hepatitis B and C, and cervical cancer was only assessed in the USA.

Interestingly, almost all of the studies only used measures that are directly related to HIV infection. Despite the fact that the importance of management of non-HIV comorbidities has been recognized, no studies measured non-HIV outcomes (e.g. blood pressure, cholesterol, and glucose) and only one measured process outcomes related to comorbidity. Also surprising is the fact that only one study used (PROMs). PROMs can help in gaining an insight into whether patients’ healthcare experiences match their expectations. The importance of including patients’ views when evaluating health care has been widely recognized. A positive physician/patient relationship may lead to better HIV treatment adherence and improved clinical outcomes. PROMs can also be used to evaluate the impact of both disease and treatment as perceived by the patient, also referred to as health-related quality of life (HRQOL). Evidence suggests that better HRQOL is associated with survival in HIV-infected patients.

Consistent with previous reviews with a similar focus, we found positive associations between healthcare provider expertise and health outcomes among HIV-infected patients. However, our results regarding facility volume were less convincing than those in previously published reviews. These reviews differ in the sense that they included many studies that took place before the introduction of cART. Furthermore, in hospital mortality was often measured, whereas our review focusses on outpatient care.

For our assessment of the results of the studies, we only selected the studies that measured viral suppression. We did this for the sake of comparability of studies but are aware of the fact that we have not presented associations with other outcomes of care. We do, however, believe that HIV RNA measurement is an appropriate quality of care measurement, more so perhaps than mortality (in this post-cART era) and CD4 count.

**Implications for practice**

Our findings suggest that healthcare provider experience improves outcomes among HIV-infected patients. Additional research is needed to specify the number of patients required to gain and maintain expertise. We cannot make recommendations regarding facility volume requirements for outpatient care on the basis of the identified studies. The studies took place in very different settings (the USA and South Africa), used different definitions of large hospitals (>300 and >950), and had contrasting results. The increased probability of virologic failure at large clinics in the South Africa-based study could be explained by heavy workloads, strain on the hospital infrastructure, and longer waiting times.
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The study by Wilson et al., in which the quality of care by non-physician clinicians was evaluated, provides additional support for the effectiveness of task shifting. Task shifting is the assigning of particular tasks to healthcare workers with shorter training and fewer qualifications (e.g. cART prescription by nurses). This model of care can result in substantial cost savings and has been recommended as an approach to reduce resource shortages in low-income countries. Reviews on task shifting are available. Only one study evaluated the involvement of disciplines other than physicians, non-physician clinicians, or nurses. The results support the involvement of a clinical pharmacist in HIV outpatient care. More evidence regarding this issue can be found in the review article by Saberi et al.

Implications for research

Research needs to be extended to regions outside the USA and sub-Saharan Africa. Existing cohort studies may create opportunities to expand this research field. In Europe for example, there are multiple cohort studies, some of which participate in collaborations with other cohort studies. The collected data can be an excellent source for retrospective research into the impact of health facility characteristics (such as facility volume) on health outcomes.

Furthermore, researchers should align their methods of measuring quality of care. An initial step in this process is to define what good quality of HIV care is. Since the role of non-HIV comorbidity is increasing, researchers and healthcare providers need to go beyond HIV-related morbidity in the evaluation of health outcomes. As retention in care has been recognized as a crucial step in maximizing patient outcomes, we believe it should continue to be measured in quality of care studies. Mugavero et al. present a number of released core indicators for retention in care. In addition, patient preferences and satisfaction should play an important role in the evaluation of quality of care. In a systematic review, Land et al. provide an overview of methods for measuring patient satisfaction in HIV care delivery. The authors concluded that there is no gold standard, and findings were used to develop a validated questionnaire. There are several sources for HIV-related measures, including the article by Catumbela et al., in which the authors propose a core set of HIV-related quality of care measures based on a literature review.

In conclusion, the studies that demonstrate associations between the quality of HIV outpatient care and facility and care provider characteristics are not scarce, but too diverse and inconsistent to guide policy regarding standards of care. Important reasons for this are the heterogeneity of study designs and the underrepresentation of studies outside the USA and sub-Saharan Africa. Patient views and non-HIV comorbidities should be included in the assessment of quality of HIV outpatient care in future studies.
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