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Determining Costs in VA

Research Design Problems and Solutions Illustrated With Case Studies

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BACKGROUND. Department of Veterans Affairs (VA) administrative cost data bases contain inaccuracies and do not provide patient-level data.

OBJECTIVE. To describe methods of VA cost determination that are appropriate for specific types of studies and to exemplify these methods with case studies.

RESEARCH DESIGN. VA utilization and cost data sources are described, and their limitations highlighted. Strategies for determining costs are discussed for health care that is critical to the study, for other types of health care, and for new programs or interventions. Three case studies are presented to illustrate cost-finding methods.

RESULTS. A hybrid approach to determining VA costs is discussed. For health care that is critical to the study, administrative data can be replaced or supplemented with primary data, information from the fiscal or other services, or non-VA data. Primary data are also needed to evaluate new programs or interventions. Less intensive data gathering methods can be used for health care that is not central to the study. The first case study illustrates cost determination for a randomized controlled trial, using an example of alternative ways of maintaining hemodialysis access graft patency. The second case study illustrates the determination of costs for all outpatient procedures to use in billing for veterans with private health insurance. The third case study describes the estimation of cost savings from regionalizing open heart surgery.

CONCLUSIONS. Despite problems with VA administrative cost data, accurate VA costs can be determined.

Key words: veterans; costs; data. (Med Care 1999;37:AS18–AS26)

This paper summarizes issues that analysts need to consider when designing cost analyses within VA. It does not provide a cookbook for conducting cost studies. By outlining the decisions that an analyst should consider, it is hoped that researchers can generate results that will withstand critical review. A dilemma occurs because VA's administrative cost databases are known to contain inaccuracies and because patient-level data are not yet widely available or validated. Researchers must balance the possible inaccuracies in the available administrative data with the effort and expense of collecting supplementary cost data. This paper provides guidance on how to resolve this dilemma for specific research studies. We first discuss issues relevant to the choice of utilization data. In most studies, the total cost of a category of health care (eg, hospitalizations, outpatient procedures) is the product of the quantity and unit cost of that type of health care. Therefore,

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utilization data sources as well as cost data sources must be chosen. Next, we summarize sources of VA costs. A hybrid approach to the collection of cost data is discussed in which more effort is suggested for the components of health care which are critical to the study question. We conclude with three case studies that illustrate how VA costs have been determined in specific projects.

In addition to the choice of utilization and cost data for determining VA costs, there are many other issues that researchers must address: (1) the type of cost analysis (cost identification, cost effectiveness, and cost utility); (2) perspective (VA, society, and patient); (3) scope (medical costs and time costs); (4) discounting future values; (5) sensitivity analysis; and (6) presentation of results (ratio of costs to effectiveness and incremental cost-effectiveness). These issues are beyond the scope of this paper and are discussed elsewhere.[1–4] We focus on determining VA costs.

Sources of Utilization Data

Table 1 highlights the data sources relative to the level of detail available. A summary of the data sources is given elsewhere.[5–6] Cells labeled "maybe" correspond to data elements that are known to be incompletely reported, although there is no catalog of which facilities have complete data and which do not. Before using these items, researchers must verify their completeness at the facilities being studied.

Patient Treatment File

The Patient Treatment File (PTF) and Outpatient Care File (OPC) are available to VA employees from the Austin Automation Center, VA's central computing facility housing all VA administrative data files. The PTF includes an abstract for each discharge from VA facilities and provides information on patient characteristics, diagnoses, procedures, and surgeries. The OPC contains a record for each outpatient visit to VA facilities and provides information on patient characteristics and clinic stops. In 1997, ICD-9 diagnoses and procedure codes were added, but the quality of these data has not been evaluated.

Veterans Integrated Health Systems Technology and Architecture

VISTA (formerly the Decentralized Hospital Computer Program (DHCP)) is a computerized data system containing detailed clinical information on all encounters in VA facilities, including laboratory and radiology tests with their results, outpatient visits, hospitalizations, dental care, and prescriptions. Obtaining access to VISTA is difficult and is generally accomplished at the local facility level. The data were designed as an electronic medical record for clinical use and are difficult to use for research.

Event Capture

Event Capture is currently being implemented in VA facilities to provide the utilization inputs to the new cost accounting system, the Decision Support System (DSS), which is described below. Detailed information on inpatient and outpatient care, including laboratory and radiology tests, is included. However, this system is currently being implemented and, thus, is not in use at all VA facilities. In addition, its accuracy has not been verified.

Primary Data

None of VA's administrative data sources contains all of the utilization elements. Only primary data collection efforts can obtain a comprehensive set of utilization data. However, more intensive collection efforts are required to obtain data from medical records, which provide retrospective utilization, and from patient or provider reports, which provide prospective utilization using data collection forms developed by the researcher.

Issues in Choosing Utilization Data Sources

Several research design issues must be considered when selecting utilization data sources.

The Research Question

The specification of the research question will guide decisions as to what inputs need to be

TABLE 1. Sources of Utilization Data

Input Measure	Data Source					
	PTF	OPC	VISTA (local access only)	Event Capture*	Medical Record Abstract	Patient/ Provider Reports
Inpatient length of stay (LOS)	Yes		Yes	Maybe	Yes	Yes
OR surgeries	Yes		Yes	Maybe	Yes	Yes
OR time			Yes	Maybe	Yes	Yes
Inpatient non-OR procedures	Maybe		Maybe	Maybe	Maybe	Yes
Inpatient drug use			Yes	Maybe	Yes	Yes
Inpatient nursing care						Yes
Inpatient rehab services			Maybe	Maybe	Maybe	Yes
Long term care LOS	Yes		Yes	Maybe	Yes	Yes
Outpatient visits		Yes	Yes	Yes	Yes	Yes
Outpatient surgeries		Yes†	Yes	Yes	Yes	Yes
Outpatient procedures		Yes†	Yes	Yes	Yes	Yes
Outpatient Rx drug use			Yes	Maybe	Yes	Yes
Outpatient rehab services		Maybe	Maybe	Maybe	Yes	Yes
Outpatient counseling services		Maybe	Maybe	Maybe	Maybe	Yes
Home health services						Yes
Hospice care						Yes
Non-VA services‡						Yes
Patient expenses						Yes
Caregiver inputs						Yes

* Event capture is in the process of being phased in across the VA system. Some facilities have been up and running for over 1 year and are thought to be providing very reliable data. Other facilities have yet to get up and running.

† The OPC file maintained by Austin now contains more detail on outpatient surgeries and procedures. The quality of this data has yet to be fully evaluated.

‡ The Fee Basis File is a database which exclusively reports on non-VA services paid for by the VA. The variables include: patient identifiers; length of stay if inpatient care; and payments made. It does not contain detailed clinical information about the patients or the services received.

counted and assigned a cost estimate. Often times, it will be possible to identify which types of events or items are central to the research question or are likely to drive the cost estimates, and to focus research efforts toward the careful measurement of these items. For example, for insulin-dependent diabetics, prescription costs may account for the majority of costs, while all upper gastrointestinal care would be critical to a study of dyspepsia.

If cost is a secondary outcome measure in part of a larger study, there will typically be fewer resources available for the cost analysis. In this case, the analyst might not be able to prospectively collect all of the detailed utilization data desired. It will be necessary to specify the most important components of utilization, and focus efforts to collect cost data for them.

The analyst must also choose databases that allow data collection for the necessary time frame. For example, if the goal is to compare a new treatment to standard care, the time frame must be long enough to observe the likely effects of the intervention.

The data chosen must provide costs at a level of aggregation appropriate for answering the research question. Studies might focus on individual patients as in clinical trials, special programs for groups of patients, hospital-level costs, or VA-wide costs.

Single Site Versus Multi-Site Studies

In multi-site studies, the availability and uniformity of data across sites as well as the expense of collecting primary data, will influence the selection of data sources. It is easier and cheaper to obtain data from administrative databases. However, they lend themselves to measuring utilization at an

aggregate level, such as bed days of care or outpatient visits, and lack detailed information, such as prescription drug utilization and time spent in an outpatient clinic. As the number of patients or sites increases, the cost of primary data collection increases and the use of administrative data sources may be the only feasible strategy. The collection of primary data is likely to be far cheaper in single-site studies, making this option more feasible than in multi-site studies.

Retrospective Versus Prospective Studies

If the study is retrospective, the analyst will need to determine if administrative datasets are sufficient to support the analysis or whether chart abstractions are necessary and/or feasible. The number of patients and the number of sites will also influence this decision. In prospective studies, the researcher can use administrative data, available within about a month in VA or can design data collection forms to obtain primary data.

Data Availability and Quality

The availability and quality of data vary from facility to facility. For example, there are time lags before data from the automated medical records that are available in the administrative databases. New databases go through transition periods as they are phased in, when data accuracy is unknown, and the data are only available at selected facilities.

Sources of Cost Data

Table 2 lists sources of data for costing VA health care, including the structure and cost measures available and limitations of each database.

Cost Distribution Report

The CDR reports facility costs, full-time equivalent employees, and the number of units provided by each Cost Distribution Account (CDA) at each medical center. The CDAs represent groups of inpatient bed sections and outpatient clinic stops. Researchers often use the CDR to obtain costs per inpatient day and costs per clinic stop.

The CDR has been criticized for data inaccuracies and incomparability across facilities.[5–6] The mapping of bed sections and clinic stops to CDAs requires considerable effort, as definitions shift over time and new CDAs are not implemented simultaneously at all facilities. In addition, some of the allocation practices limit the ability to obtain costs needed for research. For example, the CDR cannot provide costs at the patient level or for specific tests, such as x rays.

Financial Management System

The Financial Management System (FMS) gives costs by medical center, cost center, and subaccount (eg, physicians full time, electricity); the system also includes control points that track dedicated funds (eg, substance abuse enhancement).

These data can provide the following: (1) total costs by cost center (eg, medical, dietetic, and pharmacy); (2) total costs by specific resource (eg, electricity, physicians full time); (3) total costs for specific resources within cost centers; and (4) total program costs that appear as control points.

Whereas the quality of the FMS data is thought to be superior to the CDR, it has limitations.[5] For example, there are inconsistencies across facilities in the choice of cost center and subaccount to which specific costs are assigned. Control point data are not necessarily allocated accurately, and adding data for new programs is slow.

Decision Support System

The Decision Support System (DSS) is a new cost accounting system that is being implemented by VA to provide costs at the patient level for each hospital stay or day of ambulatory care. In addition, a DSS corporate roll up includes aggregate data by facility and diagnosis-related group on the number of discharges, average cost, and average length of stay.

At present, accessing DSS is difficult. Permission must be obtained from a facility or the network office to access a given facility's data. In addition, the accuracy of DSS has not been investigated thoroughly.[7] As each facility had discretion in how to implement DSS, the comparability of data across facilities is unknown.

TABLE 2. Cost Data Sources

Database	Structure	Cost Measures	Limitations
Cost distribution report (CDR)	Costs by facility, bed section, clinic stop, cost center. FTEE and units given.	(1) Total facility (2) Total inpatient and outpatient per facility (3) Cost/day and cost/clinic stop (4) Personnel and all other (5) Cost center within bed section and clinic stop	(1) Allocations not accurate (2) Allocations not consistent across facilities (3) Broad grouping of bed sections and clinic stops (4) Negative balances appear (5) Excludes accounts with 0 costs (6) Reports accounts with 0 workload as 0 costs (7) Capital costs inaccurate
Centralized Accounting for Local Management (CALM); Financial Management System (FMS)	Costs by facility, control point, cost center, & subaccount	(1) Total costs by cost center (2) Total costs by subaccount (3) Breakdown of costs by subaccount within cost center (4) Total program costs	(1) Inconsistent assignment to cost center/subaccounts across facilities (2) No allowance for personnel in more than one cost center or control point (3) Slow addition of new programs (4) Control point data may be inaccurate (5) Negative balances appear
Decision support system (DSS)	Costs by patient & encounter	(1) Patient costs per hospital stay and ambulatory visit day (2) Cost per intermediate product (3) Cost per department (4) Average costs by facility and DRG	(1) Difficult to access (2) Differences across facilities in implementation (3) Accuracy not verified (4) Not all utilization is assigned a cost (5) Not all costs are matched with utilization (6) Cannot easily distinguish long-term care from acute inpatient care
Primary data		(1) Costs per health care service (2) Costs for a program or intervention	(1) Must have valid data collection process (2) Expensive to obtain
Non-VA data	Medicare, private insurers	(1) Charges or payments per covered service (2) Cost/Charge ratios for acute hospital care	Accuracy of representing VA costs unknown

Primary Data

Another option is to collect primary data. A mechanism is established to track all resources used to provide the health care being evaluated. This method is especially useful when cost data are unavailable from the VA databases, such as costs for a special program. Primary data can also be used to supplement data from the CDR, FMS, or DSS. For example, in an evaluation of the costs of mobile clinics, primary data on personnel time and salaries were used to clean the personnel data obtained from FMS.[8] Whereas the accuracy of primary data is likely to exceed that of the VA databases, it is very expensive to collect.

Non-VA Data

When costs are unavailable or difficult to obtain from VA sources, non-VA cost data provide an option. Charges or payments for detailed services can be obtained for Medicare or private insurers (eg, chest x ray, intermediate ambulatory visit). Non-VA data can be used to create pseudo bills or a clinical cost function for costing inpatient hos-

pital care.[9] The disadvantages of non-VA data are that they might not accurately approximate VA costs, and non-VA data can be expensive to purchase; however, if comparisons within VA are being made, non-VA data would only have to be accurate reflections of relative costs, not of the actual levels of costs. In some studies, identifying costs for detailed utilization elements might be more important than using costs directly from VA sources. Non-VA costs can also provide a comparison for checking the validity of VA cost data.

Strategies for Choosing Cost Data Sources

The overarching issue in choosing cost databases is balancing the detail of the data with the practicality and expense of data collection. A hybrid approach can be used, in which detailed data are collected on the components of health care which are critical for determining the costs of the program or intervention being studied, and less detailed data are used for other types of health care.

Critical Cost Elements

For health care that is important for determining costs in a study, VA databases must be supplemented with primary data or non-VA data. Critical health care includes care that is very expensive, occurs frequently, or is central to the evaluation. An example is psychiatric visits in an evaluation of alternative treatments for depression.

First, primary data can be collected. This method could range from a micro-costing effort in which all resources are tracked, to collecting primary data for only the main resources. For example, micro-costing for psychiatric visits would consist of tracking the personnel time, supplies, equipment, and space used. Then, costs for each of these components would be obtained from the fiscal and psychiatry services. A less expensive effort might involve tracking personnel time for a sample of visits during the study, assuming the time per visit from the sample was typical, and using FMS data to determine personnel costs. Then, costs for nonpersonnel items could come from the CDR.

Second, CDR data might be verified and corrected by the medical centers in the study. For example, the CDR account for open-heart surgery could be reviewed and changes could be made to improve its accuracy.

Third, non-VA data can be used. Non-VA data can be obtained for detailed services, such as endoscopy and hospitalization by DRG. Non-VA data can be used to generate a pseudo bill for inpatient care or to estimate a clinical costing function.[9]

Other Cost Elements

Studies often involve collecting utilization data for all health care which patients receive, even if it is unrelated to the focus of the study. An example is orthopedic care in an evaluation of alternative treatments for depression. It might be impractical to collect detailed cost data on such care.

There are several alternatives. First, the CDR might be used directly. For example, a study of depression patients might focus on obtaining detailed costs for mental health care but might use the CDR for all other care. Second, VA cost data can be used to estimate a cost per DRG for inpatient care.[10] Third, non-VA data can be used, such as for health care not included in the CDR.

New Programs or Interventions

For new programs or interventions, it is likely that primary data will have to be collected. Costs for categories of resources, such as personnel, supplies, and equipment, are tracked.

Case Studies

The following case studies were chosen to illustrate the cost and utilization issues described earlier, as they are typical cost studies conducted in VA.

Case Study 1: Costing for a Cooperative Study

Objective. To estimate the incremental cost of maintaining hemodialysis access graft patency with a new drug.

Desired Measures. Cost per month of additional graft life for a cohort of patients followed over a 2-year period. The expected increased graft life and the resultant decrease in the need for

medical or surgical interventions associated with the use of the new drug may generate a net savings to VA.

Critical Cost Elements. Outpatient and inpatient procedure costs related to access graft maintenance or replacement. These procedures included angiography to monitor the access graft, angioplasty to reopen partially blocked grafts, radiological thrombolysis of the graft, surgical revision of the access graft, and surgical replacement of the access graft.

Other Cost Elements. Other costs reflected the inpatient length of stay and outpatient visits without procedures.

Utilization Data. As utilization for the critical cost elements are not consistently coded in the utilization databases, we designed case report forms to prospectively capture this information. For the other cost elements, the administrative databases were sufficient.

Cost Data for Critical Cost Elements. To assign a cost to procedures done on an outpatient basis or for inpatients in nonoperating room settings, we used Medicare's relative value units (RVUs) assigned to CPT-4 procedure codes. Based on a sample of about 3.9 million outpatient CPT-4 codes, we computed an average RVU per outpatient visit by outpatient clinic. By multiplying total visits by the average RVU per visit, we computed an RVU-weighted measure of workload in the outpatient clinic. The dollars allocated to the Cost Distribution Accounts (CDR) were then divided by this measure to estimate an average dollar per RVU within each clinic. We then multiplied the RVUs per procedure by this conversion factor to estimate the cost of a procedure in a nonoperating room setting. The estimated cost per RVU was similar to the current reimbursement under the Medicare physician payment program.

For operating room (OR) procedures, we divided the costs reported in CDR account 1212.00 by the OR RVUs reported in the Resource Planning and Management (RPM) database to obtain an estimated cost per OR RVU. This unit cost was then multiplied by the ICD-9 procedure-code-specific RVUs maintained by the Allocation Resource Center to obtain a procedure-specific cost estimate.

Cost Data for Other Cost Elements. Daily bed section costs were used to estimate costs for bed days of care. For outpatient visits without procedures, average costs per visit were used.

Results. Based on a Markov model, which simulates the utilization of resources by a cohort of hemodialysis patients over a 2-year period, our preliminary cost estimates suggest that the use of the drug would save VA $475 per month of graft life gained (expected savings = $1464, expected graft life gain = 3.1 months).

Case Study 2: Calculating Third-Party-Payer Charges Per Procedure

Objective/Background. Under Medical Care Cost Recovery (MCCR), VA charged third-party payers for the "reasonable cost" of care which insured veterans with nonservice-connected conditions received at VA medical centers. To streamline collections, VA wanted to charge for nonpharmacy-outpatient services by procedure. By law, these charges must equal VA costs calculated from existing VA administrative databases. A range of estimates reflected the following: (1) data limitations and (2) the legal uncertainty whether research and education were billable costs for MCCR purposes.

Framework. A charge was calculated by multiplying the Health Care Financing Administration's (HCFA) resource-based relative value units (RVU), times a conversion factor reflecting VA's outpatient costs. Our task was to use VA administrative databases to estimate this conversion factor.

Critical Cost Elements. Costs included all direct professional and medical supplies, indirect administrative and building maintenance, and depreciation on medical equipment and buildings.

Other Cost Elements. Outpatient pharmacy costs were excluded. Separate estimates were calculated with and without research/education costs.

Utilization Data. VA procedure data came from VA's Ambulatory Care Procedure File for the first two quarters of FY1997. Clinic visit data came from the Outpatient Care File for FY1996 and the first two quarters of FY1997.

Cost Data. Cost data came from the Cost Distribution Report summaries for FY1996.

Cost Estimates. A cost per RVU was calculated by dividing total nonpharmacy costs for VA outpatient care for FY1997, Quarters 1–2, by total RVUs. Total costs were calculated by totaling VA clinic stops weighted based on unit costs. Unit costs were calculated for each clinic stop based on its corresponding CDR cost account, which was cross-walked according to VA regulations in effect for FY1996. An average cost per clinic stop for

FY1996 equaled total account costs divided by total account clinic stops.

Because procedure data and procedures not assigned an RVU weight were under reported, we recalculated the conversion factor in two ways. First, we limited the analysis to clinical care, including Medicine, Surgery, Psychiatry, and Addictions clinic stops, in which 76% of procedures had reported RVU weights. Second, we assumed weights for unweighted procedures as follows: (1) a weight of one RVU; and (2) the VA average among weighted procedures a weight of 1.4 RVU.

Results. We calculated a cost per RVU of $66 (1996 dollars) or $61/RVU if education and research subaccounts were excluded. These figures compare with estimates of $63.08/unit (FY1995) and $69.99/unit (FY1994) from procedure data taken from the MCCR's Billing and Collection files.

The clinical care cost rate, excluding education and research costs, was $62/RVU. Assuming a weight of one RVU for unweighted procedures led to a conversion factor of $42/RVU, and assuming the VA average RVU among weighted procedures of 1.4 led to a conversion factor of $37/RVU. These adjusted figures were comparable to HCFA's conversion factor ($35/RVU).

Case Study 3: Impact on Costs of Regionalizing Open Heart Surgery

Objective/Background. To estimate the potential change in costs in one Veterans Integrated Service Network (VISN) from closing each of its four open heart surgery units in turn.

Framework. Savings would consist of the following: (1) eliminating operating costs and reducing bed section costs at the closed unit; and (2) economies of scale at the regionalized facilities. There would be added costs, as follows: (1) surgeries, hospital stays, and construction of new surgical intensive care unit (SICU) beds at the regionalized facilities; (2) transporting transfers; and (3) emergency cases treated outside VA.

Critical Cost Elements. We focused on operating costs and days in the surgical intensive care unit (SICU). SICU care is very expensive, and open heart surgery patients comprised 25% to 30% of SICU days.

Other Cost Elements. Days on the surgical ward, general medicine ward, and medical intensive care unit (MICU).

Utilization Data. Days by bed section for each hospital came from the FY1996 Patient Treatment File (PTF). Based on published literature, a range was assumed for the volume of surgeries which would be transferred from the hospital in which the unit was closed. The VISN provided estimates of the volume of emergency cases.

Cost Data for Critical Cost Elements. The Cost Distribution Report (CDR) open heart surgery account provided surgery costs. The study hospitals' fiscal services verified this account's personnel dollars, which were primarily for contracts with non-VA surgeons and nurses.

SICU personnel indicated that resources are maintained in proportion to the volume of patients and days of care provided. Therefore, we assumed that SICU savings from closing a unit would fall in proportion to the change in SICU days. The opposite would occur at the regionalized facilities.

Surgery costs per case for all 43 VAs that conduct open-heart surgery were used to estimate the decline in average costs that would occur with the higher surgical volumes at the regionalized facilities.

SICU personnel indicated the additional number of beds that would be needed to handle the increased volume at the regionalized facilities. Engineering personnel estimated the construction costs per SICU bed.

Cost Data for Other Health Care. Costs for stays on the surgery ward, general medicine ward, and MICU were assumed to change in proportion to the change in days (savings for the closed unit and increases at the regionalized facilities). Costs per emergency case were based on private sector payments. Transportation costs per case were obtained from the VISN.

Cost Estimate. Savings from closing a unit consisted of the following: (1) total costs in the CDR open-heart surgery account; (2) hospital stay costs (the product of total bed section costs and the proportion of inpatient days represented by open-heart surgery patients); and (3) economies of scale on the pre-regionalized volume. Added costs at the regionalized facilities consisted of the following: (1) surgery costs (the volume of transfers multiplied by average costs per operation); (2) hospital stay costs (the percentage increase in inpatient days multiplied by total bed section costs); (3) costs for emergency cases (the volume of emergency cases multiplied by price per case); and (4) transportation costs (the volume of transfers multiplied by transportation costs per case).

Results. Net savings were estimated for all combinations of assumptions, ranging from $1 million to $3 million.

Conclusion

VA's administrative cost databases do not yet provide verified data at the patient level and are known to contain inaccuracies. Researchers must balance the inaccuracies in readily available data versus the expense of collecting supplementary data. A hybrid approach in which the researcher focuses greater attention on the components of costs that are most crucial to the study can be used. These critical elements are central to the research question or are high cost. The verification of administrative data or the collection of primary data would be needed for these critical elements. Reliance on less intensive data gathering methods, such as relying on administrative cost data, will usually suffice for less important components of costs.

The case studies illustrate that a range of estimates is often generated, based on varying the assumptions underlying the cost estimates. For example, in Case Study #2, costs were calculated including and then excluding research and education costs, based on a legal question of whether these costs could be billed to third-party insurers. In Case Study #3, uncertainty about some assumptions yielded a range of assumptions which, in turn, led to a range of cost estimates. The range of reported values underscores to decisionmakers the stability of the final answers with available data.

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