UNIVERSITY OF CALIFORNIA, SAN FRANCISCO
AUDIT AND ADVISORY SERVICES

Data Management Review
Project #16-021

February 2016

University of California
San Francisco

UCSF

Audit and Advisory Services

February 10, 2016

Cliff Skinner
Vice President, Revenue Cycle

David Dobbs
Executive Director
Enterprise Information and Analytics, Information Technology

James Bennan
Executive Director
Financial Operations, Decision Support Services

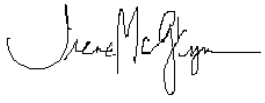
SUBJECT: Data Management Review

UCSF Audit and Advisory Services (AAS) conducted a review of data management. Our services were performed in accordance with the applicable International Standards for the Professional Practice of Internal Auditing as prescribed by the Institute of Internal Auditors (the "IIA Standards").

Our preliminary draft report was provided to department management in January 2016. Management provided us with their final comments and responses to our observations in February 2016. The observations and corrective actions have been discussed and agreed upon with department management and it is management's responsibility to implement the corrective actions stated in the report. In accordance with the University of California audit policy, AAS will periodically follow up to confirm that the agreed upon management corrective actions are completed within the dates specified in the final report.

This report is intended solely for the information and internal use of UCSF management and the Ethics, Compliance and Audit Board, and is not intended to be and should not be used by any other person or entity.

Sincerely,



Irene McGlynn
Director
UCSF Audit & Advisory Services

EXECUTIVE SUMMARY

I. BACKGROUND

As a planned audit for Fiscal Year 2016, Audit and Advisory Services (AAS) conducted a data management review to assess the adequacy of controls for ensuring data integrity.

In order to support and create various reports and key performance indicators (KPI) for critical clinical operations, decision making and financial reporting purposes across UCSF, data is being extracted from multiple data warehouses and databases which are maintained either centrally or by individual departments. The data warehouses and databases can add immense strategic value to UCSF through reporting capabilities or data analysis using vast volumes of detailed information from numerous systems. Departments and users rely on the availability and accuracy of the information provided for making decisions and enhancing operations.

Recognizing the importance of maintaining appropriate controls over data integrity, UCSF has established the Enterprise Information and Analytics (EIA) team to begin building a networked Enterprise Data Management (EDM) system that enables users, including financial/administrative staff, clinicians, researchers, and educators, to have access to timely and high quality data. The intent is to develop and implement an enterprise-wide data architecture plan that proactively manages data across UCSF in order to leverage data through inventory and discovery capabilities for data sources and reporting.

II. AUDIT PURPOSE AND SCOPE

The purpose of this review was to assess the adequacy of controls for ensuring data integrity for Decision Support Services (DSS) OmniView/UCALL and Patient Financial Services (PFS) Cash Allocation Database. For more information on these selected systems, please refer to Appendix A.

Procedures performed as part of the review included interviews, documentation reviews, walkthroughs, and validation of a sample of data elements. For more detailed steps, please refer to Appendix B.

Work performed was limited to the specific activities and procedures described above. As such, this report is not intended to, nor can it be relied upon to provide an assessment beyond those areas specifically reviewed. Fieldwork was completed in November 2015.

III. SUMMARY

Based on work performed, we did not identify any significant data integrity issues in OmniView/UCALL or the Cash Allocation Database. We did note several opportunities for improvement in the areas of governance, documentation, change management, and issue handling procedures.

The specific observations from this review are listed below.

A. Governance

- A project charter for the Enterprise Data Governance project has not been defined.

B. Cash Allocation Database and OmniView/UCALL

- There is minimal system documentation available to depict how the systems and logic were structured and built.
- Changes to the system are made on an ad-hoc basis without formal procedures or documentation to ensure consistency.
- Errors and issues are handled on an ad-hoc basis without formal procedures or documentation to ensure consistency.
- Non-transactional data such as patient names, medical record numbers, and providers' information in the Cash Allocation Database is not being updated periodically to be consistent with APEX.

Additionally, a potential opportunity for improvement was noted for enhancing system documentation to ensure these documents are consistently maintained for all databases and other systems managed by PFS and DSS.

IV. OBSERVATIONS AND MANAGEMENT CORRECTIVE ACTIONS (MCA)

A. Governance

No.	Observation	Risk/Effect	Recommendation	MCA
1	***A project charter for the Enterprise Data Governance project has not been defined.*** The Enterprise Information and Analytics (EIA) team has been leading efforts to develop and implement the multi-year enterprise-wide data governance project. However, it was noted that a project charter including scope, objectives and deliverables has not been defined and approved by senior management.	Insufficient data governance may increase the risks that inaccurate information is used for decision making, business operations, or financial reporting.	a. UCSF Senior Management should define an organizationally agreed upon scope for the enterprise data governance project. b. EIA management should develop a project charter that clearly defines the scope, objectives, and deliverables of the enterprise data governance project. c. EIA management should define requirements for "in-scope" systems. Requirements should include system documentation for data models, mapping specifications, catalogues, data dictionaries, and change management procedures.	a. By April 30, 2016, EIA management will work with Enterprise Information and Analytics Steering Committee (EIASC) to define an organizationally agreed upon scope for the enterprise data governance project. b. By April 30, 2016, EIA management will work with EIASC to develop a project charter that clearly defines the scope, objectives, and deliverables of the enterprise data governance project. c. By July 31, 2016, EIA management will work with EIASC to define requirements for "in-scope" systems.

B. Cash Allocation Database and OmniView/UCALL

No.	Observation	Risk/Effect	Recommendation	MCA
2	***There is minimal system documentation available to depict how the systems and logic were structured and built.*** Our review of available system documentation and interviews with PFS and DSS personnel identified the following: 1. Cash Allocation Database: PFS has built data logic for calculating, transforming[1], and excluding certain transactions in the stored procedures within the Cash Allocation Database; however, sufficient documentation such as written descriptions of the logic, data mapping, and comprehensive data dictionary have not been developed or maintained. Additionally, there are no documented procedures for generating monthly reports from the Cash Allocation Database.[2] 2. OmniView/UCALL: DSS has built data mapping and logic for calculating, transforming, and excluding certain transactions in the transformation rules created for each data field or in the stored procedures within OmniView/UCALL schemas or data marts;	Insufficient system documentation or approval of data architecture or logic may lead to unexpected outcomes and impairs the ability to validate or identify errors.	a. PFS management should develop and maintain system documentation such as written descriptions of the logic, data mapping, and a comprehensive data dictionary. Documented logic should be communicated to senior management, Faculty Practice Administration (FPA), and Medical Center Controller's Office. b. PFS management should develop operating procedures for generating the monthly reports from the Cash	a. By April 30, 2016, PFS management will develop and maintain system documentation such as written descriptions of the logic, data mapping, and comprehensive data dictionary. Documented logic will be communicated to senior management, FPA, and Medical Center Controller's Office. b. By April 30, 2016, PFS management will develop operating procedures for generating the monthly reports from the Cash Allocation Database. c. By February 28, 2017, DSS management, in conjunction with the IT Enterprise Information and Analytics (EIA)

[1] Transformation may include various operations including but not limited to filtering, sorting, aggregating, joining data, cleaning data, generating calculated data based on existing values, validating data, etc.

[2] Monthly cash allocation reports detailing hospital billing (HB) revenue collections are distributed to Faculty Practice Administration (FPA), Medical Center Controller's Office, and individual cost centers. FPA uses the information to allocated HB revenue to various cost centers. For FY2015, approximately $81.8 million were allocated.

No.	Observation	Risk/Effect	Recommendation	MCA
	however, sufficient documentation such as data mapping and dictionary have not been developed or maintained. University policy requires that system documentation, including business and functional requirements, data dictionaries or metadata registries, mapping specifications, reporting requirements, and workflow diagram, approval, quality assurance and change management records should be documented and retained for three years after the system is decommissioned.[3]		Allocation Database. c. DSS management should develop and maintain system documentation such as data mapping and dictionary for OmniView/UCALL once the requirements are established.	team, will complete the following: 1. Categorize all tables created within UCALL based on the purpose. 2. Document all tables related to the financial integration efforts once the requirements are developed by Enterprise Information and Analytics Steering Committee (EIASC). 3. Establish a plan to document the remaining tables with a phased approach.
3	***Changes to the system are made on an ad-hoc basis without formal procedures or documentation to ensure consistency.*** Review of the Cash Allocation Database and OmniView/UCALL identified that change management is being performed on an ad-hoc basis, and formal procedures, including requirements to perform testing, obtain appropriate approvals, and maintain change logs have not been developed or documented. As there is no log or documentation maintained for changes made in the Cash Allocation Database and OmniView/UCALL, we were unable to	The lack of change management procedures may result in unauthorized changes being made or prohibits management's ability to track and document approved	a. PFS management should develop and implement formal change management procedures and maintain change records. b. DSS management should develop and implement formal change	a. By April 30, 2016, PFS management will develop and implement formal change management procedures and maintain change records. b. During the course of the audit, DSS developed and implemented formal change management procedures. No further

[3] UCOP Records Retention Schedule requires system documentations to be retained for three years (09.A Information Technology Records-IT Proposals, Design and Implementation Records).

No.	Observation	Risk/Effect	Recommendation	MCA
	select a sample of changes to validate the appropriateness of testing performed and approvals obtained. University policy requires that all changes to a system are conducted according to planned and authorized change management procedures and all changes should be recorded.[4]	changes to the systems or databases.	management procedures and maintain change records. Given the enormous number of data elements and tables that are added or updated in maintaining OmniView/UCALL, criteria for defining 'changes' that would be subject to the new change management procedures should be created.	action is required.
4	***Errors and issues are handled on an ad-hoc basis without formal procedures or documentation to ensure consistency.*** Errors and issues for the Cash Allocation Database and OmniView/UCALL are handled by PFS and DSS staff respectively on an ad-hoc basis after being notified by users or e-mails (e.g. Batch job failures). There are no issue logs or documented error and issue handling procedures, including requirements for timely tracing, identification, or escalation and resolution of the errors or issues. University policy requires that system records that document, control, monitor, and track through	Absence of formal error and issue handling procedures and records may increase the risks that errors and issues may not be resolved consistently, completely or timely. Additionally, it may be difficult	PFS and DSS management should develop and implement formal error and issue handling procedures and maintain issue logs.	a. By April 30, 2016, PFS management will develop and implement formal error and issue handling procedures and maintain issue logs. b. During the course of the audit, DSS developed and implemented formal error and issue tracking procedures. No further action is required.

[4] UCOP IS-3, Electronic Information Security, requires that all changes to a system are conducted according to planned and authorized change management procedures that ensure the recording of all changes, including monitoring and logging of all changes, steps to detect unauthorized changes, confirmation of testing, authorization for moving application programs to production, and back out plans (IS-3§III.C.2.e).

No.	Observation	Risk/Effect	Recommendation	MCA
	resolutions for system problems should be documented and retained for three years.[5]	to perform analysis to improve operational efficiency or effectiveness without records of previous issues and resolutions taken.		
5	***Non-transactional data such as patient names, medical record numbers and providers' information in the Cash Allocation Database is not being updated periodically to be consistent with APEX.*** Comparison of a data sample in the Cash Allocation Database and APeX identified the following: [6] • Three patients had different names; • One patient had a different medical record number (MRN); and • Two visits had different attending providers. The Cash Allocation Database pulls transactional data from APeX whenever changes are made and as non-transactional data is pulled when it was initially created.[7] Therefore, any subsequent changes made to non-transactional data in APeX will create discrepancies between the Cash Allocation Database and APeX.	Having outdated information in the Cash Allocation Database increases the risk that management may use the inaccurate data for their operations or decision making.	PFS should capture all updates and changes made in APeX including non-transactional data to ensure the information in the Cash Allocation Database is accurate and complete.	During the course of the audit, PFS management has taken appropriate actions to resolve the observation. No further action is required.

[5] UCOP Records Retention Schedule requires IT Operation records to be retained for three years (09.B Information Technology Records-IT Operations Records).
[6] A sample of data elements were reviewed for a total of 2,807 records in the Cash Allocation Database and APeX.
[7] The Cash Allocation Database is scheduled to extract information from APeX daily.

No.	Observation	Risk/Effect	Recommendation	MCA
	Although non-transactional data (including patient demographic information, MRN, and providers' information) may not be as critical as transactional data for the Cash Allocation Database, this information is included in the monthly Cash Allocation reports and may be used by departments.			

C. Opportunity for Improvement

No.	Observation	Risk/Effect	Recommendation
6	***System documentation needs to be consistently maintained for all databases and other systems managed by PFS and DSS.*** As with any system, it is vital to maintain sufficient system documentation to ensure continued business operations should institutional knowledge be lost due to changes in personnel. Additionally, system developers and personnel who manage systems may over time fail to recall how the business and functional requirements and logic were defined and built into the systems.	Insufficient documentation may preclude the ability for the University to carry out operations when the institutional knowledge is not retained due to changes in personnel.	PFS and DSS should develop a process to ensure that system documentation are sufficiently maintained and kept current for all systems managed by PFS (i.e. Patient Refund and Transplant) and DSS (i.e. EPSi).

Appendix A

Name	Year Built	# of Users	Data Source			Outputs (ETL Frequency)
			Main Data Sources	Data Type	ETL[8] Frequency	
OmniView/ UCALL MS SQL Database	1998 [9]	Approx. 50 [10]	APeX (from Clarity)	ADT, Ambulatory, HB/PB, Inpatient, OpTime and Willow	Daily	• Data marts are created within OmniView/UCALL for dashboard purposes: o Revenue Cycle Dashboard (daily) o Service Line Dashboard (monthly) • Ad-hoc reports at requests of departments • Demographic information for Orthopedic patients (monthly) • Benioff Children's Hospitals (BCH) Consolidated Reports (monthly) [11]
			SFODSPRD	HBS and Payroll	Daily	
			EPSi	Cost, transaction, and encounter	Daily	
			Pathways Financial Management (PFM)	Account payables (APs)	Daily	
			Pathways Materials Management (PMM)	Material management and purchasing	Daily	
			Salesforce	Nursing Performance Improvement (NPI)	Daily	
			PeopleSoft[12]	General Ledger	Daily	
			RL Solutions	Incident Reporting	Monthly	
			University HealthSystem Consortium (UHC)	Diagnosis and encounters	Daily	
			TrendStar	Benioff Oakland Children's Hospital financials	Monthly	
Cash Allocation (Database) MS SQL Database	2000	Approx. 5 [13]	APeX (from Caché)	Charges and transactions	Daily	• Monthly reports (excel spreadsheet provided to FPA, Medical Center Controller's Office, and all Cost Center departments. • Ad-hoc reports at requests of departments

[8] Extract, transform, load (ETL).
[9] Although OmniView/UCALL was initially built in 1998, it has been continuously evolving by adding new data fields and changing logic to meet new business requirements.
[10] This does not include the number of "View-Only" users who can see data through revenue cycle and service line dashboard tools.
[11] This component was built in October 2015 and became available for 5 users in November 2015.
[12] This component was under development and not used as of October 2015.
[13] This does not include the number of users who receive and use monthly cash allocation reports.

APPENDIX B

To conduct our review the following procedures were performed for the areas in scope:

- Interviewed key department personnel from DSS, PFS, and EDWA;
- Reviewed relevant UC and UCSF policies and procedures;
- Assessed change management procedures;
- Assessed error and issue handling procedures;
- Compared a sample of data elements in OmniView/UCALL and the Cash Allocation Database with source data to validate data integrity;
- Assessed the adequacy of system documentations; and,
- Assessed governance structure of the data warehouse and database.