Memorandum

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To: Public Record for the 2006 Effluent Guidelines Program Plan
EPA Docket Number OW-2004-0032 (www.epa.gov/edockets/)

Date: August 4, 2005

Re: Industry Sectors Being Evaluated under Proposed "Health Services Industry" Category

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Overview

EPA establishes technology-based national regulations, termed "categorical pretreatment standards," for categories of industry discharging pollutants to Publicly Owned Treatment Works (POTWs) that may pass through, interfere with or are otherwise incompatible with POTW operations. CWA section 307(b). Generally, categorical pretreatment standards are designed such that wastewaters from direct and indirect industrial dischargers are subject to similar levels of treatment. EPA has promulgated such pretreatment standards for 35 industrial categories.

EPA is reviewing various indirect discharging industries without categorical pretreatment standards to determine whether their discharges were causing pass through or interference, in order to determine whether categorical pretreatment standards are necessary for other industrial categories.

As discussed in the *2005 Annual Screening-Level Analysis* (see DCN-02173), stakeholder comments and pollutant discharge information have helped EPA identify industrial sectors for this review. In particular, EPA has looked more closely at sectors that are comprised entirely or nearly entirely of indirect dischargers, and is grouping them into the following seven industrial categories: Food Service Establishments; Industrial Laundries; Photoprocessing; Printing and Publishing; Independent and Stand Alone Laboratories; Industrial Container and Drum Cleaning; and Health Services Industry.

EPA is including within the Health Services Industry the following activities: Independent and Stand Alone Medical and Dental Laboratories, Offices and Clinics of Doctors of Medicine, Offices and Clinics of Dentists, Nursing and Personal Care Facilities, Veterinary Care Services, and Hospitals and Clinics. This memorandum describes the rationale for this grouping by examining the type of operations performed, pollutants and wastewaters generated, and available pollution prevention and treatment options for each industry sector. At the end of this

memorandum is further information about Independent and Stand Alone Medical and Dental Laboratories (Attachment 1), Offices and Clinics of Dentists (Attachment 2), and Hospitals and Clinics (Attachment 3).

Type of Operations Performed

All six industry sectors are grouped under the two digit SIC code 80, "Health Services," and the two digit NAICS code 62, "Health Care and Social Assistance." The Census Bureau defines the Health Care and Social Assistance industrial sector as:

The Health Care and Social Assistance sector comprises establishments providing health care and social assistance for individuals. The sector includes both health care and social assistance because it is sometimes difficult to distinguish between the boundaries of these two activities. The industries in this sector are arranged on a continuum starting with those establishments providing medical care exclusively, continuing with those providing health care and social assistance, and finally finishing with those providing only social assistance. The services provided by establishments in this sector are delivered by trained professionals. All industries in the sector share this commonality of process, namely, labor inputs of health practitioners or social workers with the requisite expertise. Many of the industries in the sector are defined based on the educational degree held by the practitioners included in the industry.

Excluded from this sector are aerobic classes in Subsector 713, Amusement, Gambling and Recreation Industries and nonmedical diet and weight reducing centers in Subsector 812, Personal and Laundry Services. Although these can be viewed as health services, these services are not typically delivered by health practitioners.[1]

As described in this definition, all six industry sectors identified by stakeholders require services to be delivered by trained professionals for the purpose of providing health care and social assistance for individuals. These entities may be free standing and perhaps privately owned or may be part of a hospital or health system. These services can include diagnostic, preventative, cosmetic, and curative health services and may include the following seventeen operations, not all of which generate wastewater:

- Administrative Activities and Services;
- Support Services;
- Facilities Management, Maintenance, and Plant Operations;
- Laboratory Services;
- Diagnostic Services;
- Surgical Services;
- Inpatient Care Services;

[1]U.S. Census Bureau. *2002 NAICS Definitions*. Available online at: http://www.census.gov/epcd/naics02/def/NDEF62.HTM#N62.

- Critical Care Services;
- Emergency Care Services;
- Respiratory Care Services;
- Dialysis;
- Physical Therapy/Occupational Therapy;
- Outpatient Services (Nonsurgical);
- Oncology/Cancer Care Services;
- Dentistry;
- Animal Research and Testing;
- Clinical Research; and
- Construction and Renovation.[2]

These seventeen operations are defined in more detail in the following document, "*Profile of the Healthcare Industry*," EPA/310-R-05-002, February 2005.

Pollutants and Wastewaters Generated

The healthcare industry provides a variety of services to support the healthcare needs of a community or individuals. Many of the activities in healthcare result in waste outputs and air or water pollution. In order to understand which activities generate polluting waste outputs, it is necessary to look at various functions within healthcare, and understand the products and supplies used and the resulting wastes.

Healthcare is vastly different from the many industries that have a defined 'product line,' a finite number of input materials and defined and consistent 'waste outputs.' There are thousands of procedures, tests, processes, and activities, which encompass as many materials. The hazardous component in healthcare waste tends to be made up of small amounts of many different wastes, emanating from many different departments. Due to the decentralized nature of service delivery in healthcare, there can be various departments with different functions all generating various amounts of hazardous waste.

In addition to the wide variety of the operations within this sector is the fact that comparatively little information exists on the pollutant discharges from the six industrial sectors identified by stakeholders. This is due to the fact that most facilities in this proposed grouping are indirect dischargers (i.e., no discharge data collected by PCS) and few facilities in this category are TRI reporters (only federal facilities in the healthcare industry are required to report pollutant release and other waste management information to TRI).[3]

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[2]U.S. EPA. *Profile of the Healthcare Industry*. Available online at: http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/health.pdf. EPA/310-R-05-002. February 2005.

[3]Ibid, Page 52.

However, currently available data suggest some common pollutants in wastewaters from these six industrial sectors. These pollutants include metals (e.g., silver and mercury), inorganic compounds (e.g., barium), organics (e.g., phenols, acetone, solvents), pharmaceutical (including antibiotics, genotoxins, antineoplastics, hormones, and other organic wastewater contaminants), biological agents (e.g., pathogens, viruses), and other chemical (e.g., cleaning agents, solvents). Source of some of these pollutants include: (1) photoprocessing (e.g., silver);[4] (2) improper disposal of mercury containing equipment or disposal of dental mercury amalgam (e.g., mercury); (3) sewage disposal of spent or unused drugs (e.g., pharmaceuticals, endocrine disrupting chemicals);[5,6] and diagnostic testing (e.g., barium). Many more examples are given in the *Profile of the Healthcare Industry*.

Photograph and X-ray processing is carried out in dental clinics, hospitals, and photo-processing laboratories. Silver-based photographic materials consist of solid crystals of silver chloride or silver bromide suspended in gelatin and coated on a film or paper support. The processing of photographic films and papers may vary somewhat, but generally consists of the following three steps: (1) Development of the image, in which metallic silver is formed in the image areas; (2) Removal of some or all of the silver, in which silver is converted to crystals of silver bromide or silver chloride and then removed as a soluble silver-thiosulfate complex in a fix solution; and (3) Stabilizing the image by rinsing residual thiosulfate and silver-thiosulfate complexes out of the emulsion layers with water, or, in the case of washless processing, with a stabilizer solution instead of water.[7] Silver is the primary contaminant of concern in photo processing wastewater. Discharges may also contain elevated concentrations of ammonia, bromide, chromium, cyanide, iron, selenium, and zinc.

Dentistry services, including oral surgery, periodontics, and oral healthcare, are provided in a wide range of settings from individual private practices to dental surgery centers that are free standing or located within large teaching and research hospitals. It is estimated that dental facilities in the United States used 40 metric tons of mercury in 1997, which may be placed in

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[4]U.S. Department of Defense. *Handbook Nondomestic Wastewater Control and Pretreatment Design Criteria*. MIL-HDBK-1005/17. Available online at: http://www.afcesa.af.mil/ces/cesc/wastewater/1005_17.PDF. October 30, 1998.

[5]Giger, Walter, Alfredo C. Alder, Eva M. Golet, Hans-Peter E. Kohler, Christa S. McArdell, Eva Molnar, Hansrudolf Siegrist, and Marc J.-F. Suter. Occurrence and Fate of Antibiotics as Trace Contaminants in Wastewaters, Sewage Sludges, and Surface Waters. Chimia 57 (2003) 485–491 © Schweizerische Chemische Gesellschaft. ISSN 0009–4293. Available online at: at http://www.sach.ch/doc/chimia/sept03/giger.pdf.

[6]*Endocrine Disrupting Chemicals (EDCs) and Pharmaceuticals and Personal Care Products (PPCPs) in Reclaimed Water in Australia*. Australian Water Conservation and Reuse Research Program. Available online at: www.clw.csiro.au/priorities/urban/awcrrp/stage1files/AWCRRP_1H_Final_27Apr2004.pdf. January 2004.

[7]U.S. Department of Defense. *Handbook Nondomestic Wastewater Control and Pretreatment Design Criteria*. MIL-HDBK-1005/17. Available online at: http://www.afcesa.af.mil/ces/cesc/wastewater/1005_17.PDF. October 30, 1998.

teeth, recycled, discharged into wastewater, or disposed of as waste.[8] About 50 percent of dental amalgam is mercury. A study by the Association of Metropolitan Sewerage Agencies found that dental offices are the largest source of mercury to POTWs, contributing more than 35 percent of mercury influent to the POTWs studied.[9] Other studies have estimated the contributions to be as high as 80 percent.[10] Other wastes from dentistry include X-ray wastes (developer chemicals, silver discharges, lead shields), high-level disinfectants, chemical sterilizers, nitrous oxide, and biohazardous wastes, especially sharps.

Two data sources for the Hospitals and Clinics industrial sector include the EPA document titled *Preliminary Data Summary for the Hospital Point Source Category*, EPA 440-1-89-060-n, September 1989,[11] and the U.S. Department of Defense document titled, Handbook Nondomestic Wastewater Control and Pretreatment Design Criteria, MIL-HDBK-1005/17, October 1998.[12] These documents state that hospital wastewater is primarily domestic in nature. Although some additional pollutants are added to the wastewater (e.g., solvents, metals, and chemical products), they are generally treated at the point of generation or mixed with other wastewaters and diluted prior to discharge. As a result, effluent concentrations for hospitals are very similar to domestic wastewater without the need for a centralized on-site wastewater treatment system. These documents did not, however, address the concern of pharmaceuticals or endocrine disrupting chemicals in wastewater.

Available Pollution Prevention and Treatment Options

There are a variety of resources on pollution prevention, wastewater treatment, and water conservation available to the six industrial sectors in the proposed grouping. There are similarities in the potential pollution prevention, wastewater treatment, and water conservation across the six industrial sectors. For example, some the options available to the proposed Health Services Industry category revolve around pollution prevention and treatment at the unit operation as opposed to a centralized on-site wastewater treatment system. The following documents a number of these examples.

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[8]Stone, Mark E., DDS. "The Effect of Amalgam Separators on Mercury Loadings to Wastewater Treatment Plants," CDA Journal, Vol. 32, No.7, July 2004.

[9]Association of Metropolitan Sewerage Agencies. *Mercury Source Control & Pollution Prevention Program Evaluation: Final Report*. March 2002 (Amended July 2002).

[10]Stone, 2004.

[11]U.S. EPA Office of Water Regulations and Standards. *Preliminary Data Summary for the Hospitals Point Source Category*. EPA 440/1-89/060-n. September 1989.

[12]U.S. Department of Defense. *Handbook Nondomestic Wastewater Control and Pretreatment Design Criteria*. MIL-HDBK-1005/17. Available online at: http://www.afcesa.af.mil/ces/cesc/wastewater/1005_17.PDF. October 30, 1998.

- Resources are presented on the Hospitals for a Healthy Environment web page (http://www.h2e-online.org) for water conservation fact sheets.

- The document titled "Water Conservation Checklist: Hospitals/Medical Facilities; Every Drop Counts!" published by the North Carolina Department of Environment and Natural Resources Division of Pollution Prevention and Environmental Assistance contains a list of water use areas throughout a hospital and ways to reduce water consumption in each of those areas. This document can be found at: http://www.p2pays.org/ref/23/22006.pdf.

  Based on this document water use in hospitals can be reduced considerably as shown in the following table:

Types of Water Uses	Average Water Use (% of total)	Potential Savings (% of total)
Cooling	53	32
Domestic	24	10
Cleaning	10	9
Kitchen	5	--
Process	4	--
Other	4	--
TOTALS	**100%**	**51%**
	139,214 gpd	**71,000 gpd**

Source: ICI Conservation in the Tri-County Area of the Southwest Florida Water Management District (SWFWMD). SWFWMD. Available online at: http://www.swfwmd.state.fl.us/conservation.waterwork/checkhospital.htm. Accessed August 10, 2005. November 1997.

- The New Hampshire Department of Environmental Services developed an environmental fact sheet titled "Water Efficiency Practices for Health Care Facilities" which also presents practices by water use area. This document can be found at: http://www.des.state.nh.us/factsheets/ws/ws-26-14.htm.

- Southwest Florida Water Management District (SWFWMD) also has a similar factsheet titled "Water Conservation @ Work: Hospitals." This document can be found at: http://www.swfwmd.state.fl.us/watercon/waterwork/checkhospital.htm.

- Healthcare Purchasing News has developed a Self Study Series to evaluate environmentally preferable products. One item in this series discusses microfiber mops which use less water than conventional cotton mops. The article discusses the economic, environmental, employee, and patient benefits of using microfiber mops. This document can be found at: http://198.151.15.185/pubs/ShouldYouMicrofiber.pdf.

- The University of Wisconsin Cooperative Extension developed a hospital waste reduction checklist which includes strategies for reducing wastewater discharges. These strategies include substitution of less toxic materials, procedures for moving or cleaning sewer lines, traps, or sumps, and chemical storage and disposal options. This document can be found at: http://www.uwex.edu/shwec/Pubs/pdf/425-9602.pdf.

- The Medical Academic and Scientific Community Organization prepared a pretreatment manual for use by hospitals to help solve a sewer discharge compliance problem. The manual outlines the elements of typical source reduction programs and a wastewater pretreatment strategy. This document can be found at: http://www.masco.org/mercury/pretreatment/index.html.

- EPA's Small Business Ombudsman developed a fact sheet for walk-in urgent care facilities and smaller hospitals. The fact sheet explains some of the best management practices (BMPs) related to toxic chemicals or hazardous materials used as part of the diagnostic, treatment, and cleaning processes used in these smaller facilities. This document can be found at: http://www.smallbiz-enviroweb.org/html/pdf/BMP_HealthCare-4.pdf.[13]

- EPA Regions 1 and 2 have on-going programs to provide information to help healthcare facilities reduce environmental impacts of their operations and improve their understanding of and compliance with environmental regulations. The EPA programs also help facilities realize the cost savings and environmental benefits that can be attained through improvements in recycling, energy efficiency and water conservation. More information can be found at: http://www.epa.gov/region1/healthcare/ and http://www.epa.gov/region2/healthcare/.

With respect to controlling mercury discharges, healthcare facilities contain mercury in some medical equipment (e.g. pressure gauges, thermometers), laboratory reagents, and common facility items (e.g., fluorescent lights, thermostats, cleaning supplies). Some hospitals approached the problem of mercury use within their facilities by following some basic steps, including:

- Conducting inventories to identify sources of mercury within their facilities;
- Making recommendations to existing hazardous waste and safety committees and the administration for reducing or eliminating these sources;
- Instituting immediate steps for mercury reduction; and,
- Devising long-term goals for the virtual elimination of mercury from their facilities.

An example of this approach was documented at two major Detroit hospitals that instituted

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[13]North Carolina Department of Environment and Natural Resources. *Environmental Best Management Practices for Small Businesses*. October 2004. Available online at: http://www.smallbiz-enviroweb.org/html/pdf/BMP_HealthCare-4.pdf.

mercury pollution prevention plans. Wastewater sampling was conducted to evaluated their performance. Before the mercury pollution prevention program, mercury measures at these sites were in the range of 0.28 ppb to 0.96 ppb. After the program was instituted, these figures dropped to 0.09 ppb to 0.15 ppb.[14]

Recently, EPA modified Resource Conservation and Recovery Act (RCRA) hazardous waste regulations to allow the healthcare facilities and other facilities that generate spent mercury-containing equipment to send this spent equipment to a central consolidation point (http://www.epa.gov/epaoswer/hazwaste/recycle/electron/crt.htm). EPA is now managing spent mercury-containing equipment under the universal waste program (http://www.epa.gov/epaoswer/hazwaste/id/univwast.htm). This regulatory change is expected to increase the number of these articles, items and devices collected (including healthcare mercury-containing equipment such as thermometers and sphygmomanometers), but more importantly, to increase the amount of mercury being diverted from the non-hazardous waste stream (e.g., discharges to POTWs) into the hazardous waste stream because it will allow generators, especially those that generate this waste sporadically, to send it to a central consolidation point. Before this regulatory change, these materials could not be consolidated by an entity unless it had a RCRA permit. Under the universal waste program, a handler of universal waste can send the universal waste to another handler, where it can be consolidated into a larger shipment for transport to a destination facility. Therefore, spent mercury-containing equipment will be easier to send to recycling and proper disposal, making it less likely that it will be sent for improper disposal.

With respect to photoprocessing, EPA's *Preliminary Data Summary for the Photoprocessing Industry,* 1997[15], identified control and treatment technologies that are available to photoprocessing operations in the health services category. These include source reduction, water reduction, and silver recovery technologies. The following table, which is reproduced from the 1997 PDS, provides a comparison of various silver recovery and management systems. According to the PDS, silver recovery is almost always practiced to some extent. The most common methods are metallic replacement and electrolytic recovery.

[14]Williams, Guy. *Mercury Pollution Prevention in Healthcare*. Available online at: http://www.newmoa.org/prevention/topichub/22/Mercury_Pollution_Prevention_in_Healthcare_NWF.htm. 1997.

[15]U.S. EPA Office of Water. *Second Preliminary Technical Assessment of the Best Available Technology, Best Demonstrated Technology and Pretreatment Technology for the Printing and Publishing Point Source Category*. Docket OW-2003-0074. December 1997.

Silver Recovery Technologies

Technology	Advantages	Disadvantages
Metallic Replacement	Can achieve 99% recovery; Can be used for all silver rich solutions; Low capital and operating and maintenance costs; Simple operation	Must be replaced on schedule; Tendency to channel and cause concentrated silver discharge; efficiency diminishes with use; High smelting and refining costs; effluent not suitable for re-use
Electrolytic Recovery	Can achieve 90% recovery; No additional chemicals released; fix solution can be recycled; Moderate capital costs Low refining costs	Cannot achieve 5 mg/L; Not suitable for silver-poor solutions
Precipitation	Can attain 0.1 mg/L Little maintenance Low to moderate capital costs	High smelting and refining costs; complex operation; operation costs vary from moderate to high; treated solution not suitable for reuse
Evaporation/Distillation	Can reduce wastes up to 90% Virtually zero overflow of silver	High energy requirements; Moderate to high capital cost
Reverse Osmosis	Efficiently recovers silver from dilute silver wastestreams; Reduces effluent volume significantly; No water treatment chemicals required; Purified water is recyclable	Capital and O&M Costs vary significantly; Frequent maintenance of membranes and pumps; works best with dilute solutions

Virtually all discharging photoprocessors discharge indirectly to POTWs. Many POTWs have stringent silver limits in their NPDES permits or need to reduce metals concentrations in biosolids. POTWs have identified photographic facilities as a whole as a major source of silver. In an attempt to provide photoprocessing facilities and POTWs with a cost-effective alternative to numeric limits and monitoring, in 1997, AMSA, the Silver Council and two industry groups for the Photographic industry developed a "*Code of Management Practices for Silver Dischargers*" (Silver CMP)[16]. The Silver CMP provides recommendations on control technologies and management practices for controlling silver discharges to POTWs, and encourages pollution prevention technologies such as water conservation. The recommended practices are defined by a minimum recovery of silver from silver-rich processing solutions (e.g. 90%, 95%, and 99%). The minimum recovery and recommended practices vary with the size of the photoprocessor, defined

[16]Association of Metropolitan Sewerage Agency (AMSA) and the Silver Council. *Code of Management Practices for Silver Dischargers*. Available online at: http://www.p2pays.org/ref/02/2003/11-17/features/digital_2003.html. Accessed January 25, 2004.

by flow volume of silver-rich solution and wash water. Four POTWs documented loadings reductions of 20% to 52% over historical baselines after CMP implementation.

Technology exists to remove dental mercury amalgam discharges. EPA's Environmental Technology Verification program demonstrated mercury removals for an amalgam separator at 99.6%-99.9%.[17]

Finally, common techniques available for all six industrial sectors for reducing or eliminating pollutant discharges from laboratory wastewaters include the following:[18]

- Substitute chemicals with less toxic alternatives.
- Use the minimum amount of chemical required.
- Label all chemical containers properly.
- Store glassware and breakable containers on textured rubber mats.
- Order chemicals in plastic-coated bottles.
- Transport solvent bottles in protective holders.
- Keep doors of chemical storage cabinet latched.
- Equip chemical storage shelves with barriers one-fifth the height of the tallest container.
- Keep all counter-top chemicals in a tray or within bermed areas.
- Never store chemical bottles and containers in sinks.
- Surround sinks and counter tops with a protective lip.
- Plug all floor drains.
- Protect safety shower drain from chemical spills with temporary plugs or sumps.
- Maintain adequate and readily available supply of spill cleanup materials.
- Check chemical disposal guidelines and POTW acceptance criteria prior to discharging to a drain.
- Keep work areas clean and well organized to help prevent accidents.
- Use drip pans and splash guards where spills frequently occur.

[17]U.S. EPA. "*Environmental Technology Verification Report: Removal of Mercury from Dental Office Wastewater*". Available online at: http://www.epa.gov/etv/pdfs/vrvs/09_vr_drna.pdf. NSF 02/01/EPAWQPC-SWP. September 2002.

[18]Anastas, P. T.; Warner, J. C. Green Chemistry: Theory and Practice, Oxford University Press: New York, 1998, Cited at: www.chemistry.org/portal/a/c/s/1/acsdisplay.html?DOC=greenchemistryinstitute\gc_principles.html.

Attachment 1:
Independent and Stand Alone Medical and Dental Laboratories Memorandum

Memorandum

From: Carey Johnston
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To: Public Record for the 2006 Effluent Guidelines Program Plan
EPA Docket Number OW-2004-0032 (www.epa.gov/edockets/)

Date: August 11, 2005

Re: Independent and Stand Alone Medical and Dental Laboratories

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Activities at medical and dental laboratories differ from those of other types of standalone laboratories. These operations are only covered by 40 CFR Part 460, Hospitals Point Source Category, if they are located at a directly-discharging hospital with greater than 1,000 beds.

Industry Profile

Medical and dental laboratories include SIC codes 8071 and 8072. The 1987 SIC Code Manual defines these SIC codes as follows:

- 8071: Establishments primarily engaged in providing professional analytic or diagnostic services to the medical profession or to the patient as prescribed by a physician. Laboratories engaged in the manufacture of medical or pharmaceutical products are classified in Manufacturing. Laboratories engaged in commercial medical research are classified in Industry 8731, and those engaged in noncommercial medical research are classified in Industry 8733.

- 8072: Establishments primarily engaged in making dentures, artificial teeth, and orthodontic appliances to order for the dental profession. The manufacture of teeth other than to order is classified in Manufacturing. Establishments providing dental x-ray laboratory services are classified in Industry 8071.

SIC Code 8071 includes medical laboratories that test blood and other tissue samples for pathogens, viruses, and chemicals such as HIV, blood sugar, and drugs. Two prominent laboratories include Quest Diagnostics and American Medical Laboratories. SIC Code 8072 includes labs that manufacture crowns, bridges, dentures, veneers, orthodontic appliances and other dental prosthetics.

Table 1-1 shows Census data for medical and dental laboratories. No stand-alone medical

or dental laboratories reported to TRI in 2000. Table 1-2 shows that only three medical laboratories have data available in the 2000 PCS, and all three are minor dischargers. Almost all facilities discharge indirectly: only three of the approximately 18,000 stand-alone medical and dental laboratories discharge directly. No dental laboratories have data available in 2000 PCS.

Table 1-1. Census Data

SIC Code	NAICS Code	Number of Facilities in 1997	Number of Facilities in 2002
8071: Medical laboratories	621511: Medical laboratories	4,655	5,513
	621512: Diagnostic imaging centers	4,421	5,577
8072: Dental laboratories	339116: Dental laboratories	7,609	7,089

Table 1-2. TRI Facility Counts

SIC Code	Number of Facilities Reporting to 2000 TRI				Number of Facilities Reporting to PCS in 2000 (Minors)
	Direct-Only	Indirect-Only	Both	No Discharge Reported	
8071	0	0	0	0	3
8072	0	0	0	0	0

Wastewater Characteristics

Wastewater Quantity

Table 1-3 presents the information available for the three medical laboratories in the 2000 PCS database.

Table 1-3. Wastewater Flows in PCS

SIC	NPID	Flow (MGY)
8071	ME0001635	5.22
8071	MT0028487	69.0
8071*	WV0105112*	28.8*

*This NPID belongs to a U.S. Fish and Wildlife Service office in West Virginia. The SIC code designation is most likely an error.

At this time, EPA did not locate other data sources for wastewater quantity for these types of laboratories.

Raw and Treated Wastewater Quality

Table 1-4 lists the facilities in the 2000 PCS database. The U.S. Fish and Wildlife Service office in West Virginia SIC code designation is most likely an error.

Table 1-4. List of Facilities in PCSLoads2000 (All Minors)

SIC	Name	Major/Minor	City	State	TWPE
8071	Mount Desert Island Biological	Minor	Bar Harbor	Maine	21.2
8071	Rocky Mountain Laboratories	Minor	Hamilton	Montana	1.86
8071	U.S. Fish & Wildlife Service	Minor	Shepherdstown	West Virginia	0

Casting molds of dental or medical prosthetics generates wastewater with plaster solids, and therefore greater TSS, in wastewater. EPA does not believe that amalgam or any other mercury-containing materials are used in dental laboratory processes (Galsky). OECA's 2004 Healthcare Sector Notebook[1] notes that molding casts, prosthetics, and other medical lab items may use Cerrobend®, a ductile, formable metal that includes lead.

Photograph and X-ray processing is carried out in dental clinics, hospitals, and photo-processing laboratories. Silver-based photographic materials consist of solid crystals of silver chloride or silver bromide suspended in gelatin and coated on a film or paper support. The processing of photographic films and papers may vary somewhat, but generally consists of the following three steps: (1) Development of the image, in which metallic silver is formed in the image areas; (2) Removal of some or all of the silver, in which silver is converted to crystals of silver bromide or silver chloride and then removed as a soluble silver-thiosulfate complex in a fix solution; and (3) Stabilizing the image by rinsing residual thiosulfate and silver-thiosulfate complexes out of the emulsion layers with water, or, in the case of washless processing, with a stabilizer solution instead of water.[2] Silver is the primary contaminant of concern in photo processing wastewater. Discharges may also contain elevated concentrations of ammonia, bromide, chromium, cyanide, iron, selenium, and zinc. At this time, EPA did not locate any other data sources on raw or treated wastewater quality.

On-Site Wastewater Treatment/Pretreatment

From OECA's 2004 Healthcare Sector Notebook, in rooms where casts are fitted and/or

[1]U.S. EPA Office of Enforcement and Compliance Assurance. *Profile of the Healthcare Industry*. February 2005. Available online at: http://www.epa.gov/Compliance/resources/publications/assistance/sectors/notebooks/health.pdf.

[2]U.S. Department of Defense. 1998. *Handbook Nondomestic Wastewater Control and Pretreatment Design Criteria*. MIL-HDBK-1005/17. Available online at: http://www.afcesa.af.mil/ces/cesc/wastewater/1005_17.PDF. Accessed October 30, 1998.

plaster molds are made, plaster recovery systems may be used. A phone conversation with a dental laboratory confirmed the use of plaster recovery systems (Galsky). Silver recovery is one method of pollution prevention for photoprocessing wastewaters. More details on this and other technologies are documented in the *Photoprocessing* profile. Common techniques at reducing or eliminating pollutant discharges from laboratory wastewaters are also detailed in the *Independent and Standalone Laboratories* profile.

References

1. National Association of Dental Laboratories web page. Available at http://www.nadl.org/. As accessed on October 22, 2004.

2. Phone conversation from Ellie Codding, EPA, to Mr. Larry Galsky, CDT, of Galsky Dental Laboratories. *Dental Laboratory Processing*. November 2, 2004.

3. U.S. EPA Office of Enforcement and Compliance. *Profile of the Healthcare Industry*. EPA/310-R-04-001. February 2005. Available online at: http://www.epa.gov/Compliance/resources/publications/assistance/sectors/notebooks/healt h.pdf.

4. Valuations Resources.com web site on Medical Laboratories. Available online at http://www.valuationresources.com/Reports/SIC8071MedicalLaboratories.htm. Accessed October 22, 2004.

Attachment 2:
Offices and Clinics of Dentists Memorandum

Memorandum

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To: Public Record for the 2006 Effluent Guidelines Program Plan
EPA Docket Number OW-2004-0032 (www.epa.gov/edockets/)

Date: August 11, 2005

Re: Offices and Clinics of Dentists

Industry Profile

Dental facilities include facilities in SIC Code 8021, Offices and Clinics of Dentists. The 1987 SIC Code Manual defines SIC Code 8021 as follows:

- This industry comprises establishments of health practitioners having the degree of D.M.D. (Doctor of dental medicine), D.D.S. (Doctor of dental surgery), or D.D.Sc. (Doctor of dental science) primarily engaged in the independent practice of general or specialized dentistry or dental surgery. These practitioners operate private or group practices in their own offices (e.g., centers, clinics) or in the facilities of others, such as hospitals or HMO medical centers. They can provide either comprehensive preventive, cosmetic, or emergency care, or specialize in a single field of dentistry.

Table 1-1. Census Data

SIC Code	NAICS Code	Number of Facilities in 1997
8021 : Offices and Clinics of Dentists	6212: Offices of Dentists	114,178

Table 1-2 shows the facility counts available from TRI and PCS.

Table 1-2. Facility Counts

SIC Code	Number of Facilities Reporting to 2000 TRI				Number of Facilities Reporting to PCS (Minors)
	Direct-Only	Indirect-Only	Both	No Water Discharge Reported	
8021	0	0	0	0	2

Wastewater Characteristics

Wastewater Quantity

Table 1-3 summarizes the wastewater flow data available in the 2000 PCS database. No facilities reported to the 2000 TRI.

Table 1-3. Wastewater Flow Data from PCSLoads2000

SIC	NPDES ID	Flow, MGY
8021	FL0033154	0.120
8021	MD0053155	1.43

Raw and Treated Wastewater Quality

Almost all dental facilities discharge to POTWs. Of the 114,178 facilities in the 1997 Census, only 2 appear in the PCS database, both of which are minor discharges. Table 1-4 lists the facilities noted as SIC Code 8021 in the 2000 PCS database. By name, both appear to be treatment plants, not dental facilities.

Table 1-4. List of Facilities in PCSLoads2000

SIC	Name	City	NPID	Major/ Minor
8021	Oak Lane Building Sewage Treatment Plant	Jacksonville	FL0033154	Minor
8021	Thunderbird Motel WWTP	Newburg	MD0053155	Minor

On-Site Wastewater Treatment/Pretreatment

Dental facility pretreatment usually includes:

- Silver recovery for X-ray wastes and
- Simple drain traps in patient chair-side sinks to recover solid particles of amalgam and other tissue.

Attachment 3:
Hospitals and Clinics Memorandum

Memorandum

From: Carey Johnston
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ph: (202) 566 1014
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To: Public Record for the 2006 Effluent Guidelines Program Plan
EPA Docket Number OW-2004-0032 (www.epa.gov/edockets/)

Date: August 11, 2005

Re: Hospitals and Clinics

Introduction

40 CFR Part 460, promulgated in 1976, applies to effluent discharges to surface water from hospitals with greater than 1,000 occupied beds. In 1989, EPA published a Preliminary Data Summary (PDS) for the Hospitals Point Source Category[1]. EPA's Office of Enforcement and Compliance Assistance (OECA) developed a Healthcare Sector Notebook in February 2005[2].

Industry Profile

Hospitals include facilities in SIC codes 8062, General Medical and Surgical Hospitals, 8069, Specialty Hospitals, Except Psychiatric (children's hospitals), and 8063, Psychiatric Hospitals. The 1987 SIC Code Manual defines these SIC codes as follows:

- *8062 General Medical and Surgical Hospitals* - Establishments primarily engaged in providing general medical and surgical services and other hospital services. Specialty hospitals are classified in Industries 8063 and 8069. This SIC code includes only General Medical and Surgical Hospitals

- *8063 Psychiatric Hospitals* - Establishments primarily engaged in providing diagnostic medical services and inpatient treatment for the mentally ill. Establishments, known as hospitals, primarily engaged in providing health care for the mentally retarded are

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[1]U.S. EPA Office of Water Regulations and Standards. *Preliminary Data Summary for the Hospitals Point Source Category*. EPA 440/1-89/060-n. September 1989.

[2]U.S. EPA Office of Enforcement and Compliance Assurance. *Profile of the Healthcare Industry*. EPA/310-R-04-001. Available online at: http://www.epa.gov/Compliance/resources/publications/assistance/sectors/notebooks/health.html. February 2005.

classified in Industry 8051. This SIC code includes: Mental hospitals, except for the mentally retarded and Psychiatric hospitals.

- *8069 Specialty Hospitals, Except Psychiatric* - Establishments primarily engaged in providing diagnostic services, treatment, and other hospital services for specialized categories of patients, except mental. Psychiatric hospitals are classified in Industry 8063. This SIC code includes: Alcoholism rehabilitation hospitals; Cancer hospitals; Children's hospitals; Chronic disease hospitals; Drug addiction rehabilitation hospitals; Eye, ear, nose, and throat hospitals: in-patient; Hospitals, specialty: except psychiatric; Maternity hospitals; Orthopedic hospitals; Rehabilitation hospitals: drug addiction and alcoholism; and Tuberculosis and other respiratory illness hospitals.

Table 1-1. Census Data

SIC Code	NAICS Code	Number of Facilities in 1997	Number of Facilities in 2002
8062: General Medical and Surgical Hospitals	622110: General Medical and Surgical Hospitals	5,487	5,404
8063: Psychiatric Hospitals	622210: Psychiatric and Substance Abuse Hospitals	801	605
8069: Other Specialty	622310: Specialty (Except Psychiatric and Substance Abuse) Hospitals	397	316
Total		**6,685**	**6,325**

EPA's 1989 PDS states that, using 1985 data, 97 percent of the hospitals are indirect dischargers. This was an increase from 1975, when 92 percent of hospitals were indirect dischargers.

Table 1-2 shows the facility counts available from the 2000 TRI and PCS databases. Using 2002 U.S. Census and 2000 PCS data, 34 of 6,325 hospitals are direct dischargers, and 99.5 percent of hospitals are indirect dischargers. Note: hospitals are exempt from TRI reporting unless they are federal facilities.

Table 1-2. 2000 TRI and PCS Facility Counts

SIC Code	Number of Facilities Reporting to 2000 TRI				Number of Facilities Reporting to PCS 2000	
	Direct	Indirect	Both	No Discharge Reported	Direct (Major/Minor)	
8062	0	0	0	1	2	20
8063	0	0	1	0	1	7

8069	0	0	0	0	0	4
Total	0	0	1	1	3	31

Wastewater Characteristics

Wastewater Quantity

EPA located wastewater volume data from the 1989 PDS, textbooks, TRI, and PCS. Table 1-3 summarizes the wastewater flow data from the PDS and textbooks.

Table 1-3. Typical Wastewater Flow Rates from Hospitals

Type of Establishment	Wastewater Flow Range (gal/day per unit)	Unit	Textbook Source
Hospital	242	Bed	1989 PDS*
Hospital, medical	125 - 240	Bed	Metcalf & Eddy
Hospital, mental	75 - 140	Bed	
Hospital	150 - 250+	Person	Standard Handbook of Environmental Engineering

*The 1989 PDS cites 1976 data from the American Hospital Association (AHA), that approximately 242 gallons of wastewater are generated per bed per day at hospitals. The PDS also states that, "based on the latest information, this figure has not changed."

From the Center for Medicare and Medicaid Services (CMS) web site[3], the number of hospital beds in 2000 was 983,628. Using the data in Table 3, hospitals discharge an estimated 120 to 240 MGD of wastewater, or 43,800 to 87,600 MGY.

Based on a survey of 26 Florida hospitals, conducted by the Southwest Florida Water Management District (SWFWMD)[4], hospitals use an average of 139,214 gallons per day (GPD) of water. Table 1-4 shows the types of water use.

Table 1-4. Types of Hospital Water Use

Types of Water Uses	Average Water Use (% of total)

[3]Centers for Medicare and Medicaid Services Web Page. Available online at: http://www.cms.hhs.gov/charts/healthcaresystem/chapter2.asp. Accessed October 22, 2004.

[4]Southwest Florida Water Management District. November 1997. *Water Conservation Facts @ Work: Hospitals*. Available online at: http://www.swfmd.state.fl.us/watercon/waterwork/checkhospital.htm. Accessed August 10, 2005.

Cooling	53
Domestic	24
Cleaning	10
Kitchen	5
Process	4
Other	4
TOTALS	**100%**
	139,214 gpd

Source: Southwest Florida Water Management District. November 1997. *Water Conservation Facts @ Work: Hospitals*.

Table 1-5 summarizes the 2000 PCS data available for flow.

Table 1-5. 2000 PCS Data Available for Flow

SIC Code	Flow, MGY	
8062	Max	3,150
	Min	0.27
	Median	18.7
8063	Max	12,300
	Min	0.34
	Median	24.8
8069	Max	15.8
	Min	2.77
	Median	12.9

Raw Wastewater Quality

Hospital wastewater is expected to contain normal sanitary wastewater contaminants plus cleaning agents, germicides, acids, and chemicals associated with laboratory and health care services. The various medical industry wastewaters include wastewaters from clinical laboratories, research laboratories, medical waste incinerators equipped with fume scrubbers, vehicle maintenance facilities, and hospital laundries. Silver may be present in the combined hospital

wastewater as a result of X-ray processing,[5] This unit operation is described in more detail in the *Independent and Stand-alone Medical and Dental Laboratories* and *Photoprocessing* profiles. Wastewater produced by hospitals and by hospital-related industries originates from many sources.

The 1989 PDS states that EPA sampled four hospitals to better characterize the contents of hospital wastewater, and determine if hospitals should be selected for further study. Criteria for selection for further study included the presence of unexpected chemicals or chemical concentrations above wastewater treatability levels. Analysis included over 400 toxic and hazardous pollutants. Based on sampling results, neither criteria were met, although five pollutants were detected at levels higher than expected for non-industrial wastewater. These pollutants were silver, phenols, barium, acetone, and mercury.

Since the 1989 PDS, many studies world wide raise the question of the fate of pharmaceuticals, including antibiotics, genotoxins, and antineoplastics, in hospital and domestic wastewater. In 2003, the USGS[6] published a study of 139 streams, which they tested for pharmaceuticals, hormones, and other organic wastewater contaminants (OWCs). At least one OWC was detected in 80% of the streams sampled, with 82 of the 95 analyzed OWCs determined in this study detected in at least one sample. The antibiotics erythromycin and lincomycin were two of the most commonly detected OWCs. In addition to antibiotics there may be other pharmaceuticals and personal care products in the untreated effluent including potential endocrine disrupting chemicals.[7,8] Although antibiotics are excreted in urine from households, hospital toilet waste has a greater likelihood of containing antibiotics.

Hospital may operate laundry facilities which typically process linens, gowns and lab coats that will contribute a certain amount of organic material, fats, oils and grease (FOG) and an alternating range of pH (alkaline detergent followed by an acidic sanitizer) to the wastestream.

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[5]U.S. Department of Defense. 1998. *Handbook Nondomestic Wastewater Control and Pretreatment Design Criteria*. MIL-HDBK-1005/17. Available online at: http://www.afcesa.af.mil/ces/cesc/wastewater/1005_17.PDF. Accessed October 30, 1998.

[6]Barnes, Kimberlee K., Dana W. Kolpin, Michael T. Meyer, E. Michael Thurman, Edward T. Furlong, Steven D. Zaugg, and Larry B. Barber. *Water-Quality Data for Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams*. U.S. Geological Survey. 1999-2000. Available online at: http://toxics.usgs.gov/pubs/OFR-02-94/.

[7]Giger, Walter, Alfredo C. Alder, Eva M. Golet, Hans-Peter E. Kohler, Christa S. McArdell, Eva Molnar, Hansrudolf Siegrist, and Marc J.-F. Suter. Occurrence and Fate of Antibiotics as Trace Contaminants in Wastewaters, Sewage Sludges, and Surface Waters. Chimia 57 (2003) 485–491 © Schweizerische Chemische Gesellschaft. ISSN 0009–4293. Accessible at http://www.sach.ch/doc/chimia/sept03/giger.pdf.

[8]Australian Water Conservation and Reuse Research Program. *Endocrine Disrupting Chemicals (EDCs) and Pharmaceuticals and Personal Care Products (PPCPs) in Reclaimed Water in Australia*. Available online at: http://www.clw.csiro.au/priorities/urban/awcrrp/stage1files/AWCRRP_1H_Final_27Apr2004.pdf. January 2004.

Depending upon the processes employed, the hospital laundry wastestream can have elevated temperatures and pH extremes and can contain starch, particulate (including lint), proteins (blood products), detergents, and oxidizers (bleach or other disinfectant). BOD and COD concentrations from laundry wastewater are usually in the normal range for domestic sewage. Some laundry chemicals (sodium hydroxide and bleach) are known to often have significant levels of mercury contamination. In addition, just one broken mercury thermometer can cause temporary high levels of mercury in the laundry wastewater. Hospital laundry wastewater flows can vary from a few hundred gallons per day to many thousands of gallons per day.[9]

Treated Wastewater Quality

Tables 1-6 and 1-7 show flow data available from the 2000 TRI and PCS. Tables 1-8, 1-9, and 1-10 show the top pollutants reported to the 2000 TRI and PCS, based on TWPE and total pounds reported.

Table 1-6. Discharges Reported to TRIReleases2000 for One Facility*

SIC Code	Discharge Status	Pounds to Stream	TWPE
8063	D	750	365
8063	I	736	358

Note: Only one facility reported water discharges to the 2000 TRI.

Table 1-7. Discharges Reported to PCSLoads2000

SIC	Pounds to Stream	TWPE
8062	20,458	4.51
8063	4,891	0.36

Table 1-8. Top Pollutant from TRIReleases2000 Data*

SIC Code	Chemical	TWPE	% of Total SIC TWPE	Pounds	% of Total SIC Pounds
8063	Chlorine	724	1	1,486	1

*Note: Only one facility reported water discharges to the 2000 TRI.

[9]Medical Academic and Scientific Community Organization, Inc. *End-of-pipe Subcommittee, Technology Identification Subgroup Report*. Available online at: http://www.masco.org/mercury/techid/index.html, December 1997.

Table 1-9. Top Pollutants from PCSLoads2000 by TWPE

SIC	Parameter	TWPE	% of Total SIC TWPE
8062	Chlorine, Total Residual	4.42	98%
	Total for SIC Code 8062	**4.51**	
8063	Nitrogen, Ammonia Total (As n)	0.14	38%
8063	Copper, Total (As Cu)	0.13	37%
8063	Zinc, Total (As Zn)	0.053	15%
8063	Nitrogen, Nitrate Total (As n)	0.034	10%
	Total for SIC Code 8063	**0.36**	

Table 1-10. Top Pollutants from PCSLoads2000 by Pounds

SIC	Parameter	Pounds	% of Total SIC Pounds
8062	Solids, Total Dissolved- 180 Deg.c	5,730.92	28%
8062	Oxygen Demand, Chem. (Low Level) (COD)	4,960.54	24%
8062	Solids, Total Dissolved	4,824.45	24%
8062	Solids, Total Suspended	3,081.54	15%
	Total for SIC Code 8062	**20,458.27**	
8063	Solids, Total Suspended	1,083.09	22%
8063	Bod, 5-day (20 Deg. C)	639.36	13%
8063	Nitrogen, Nitrate Total (As N)	544.63	11%
8063	Oil & Grease Freon Extr-Grav Meth	114.85	2%
8063	Phosphorus, Total (As P)	94.92	2%
8063	Nitrogen, Ammonia Total (As N)	74.24	2%
	Total for SIC Code 8063	**4,891.19**	

Tables 1-11 and 1-12 list the facilities reporting to the 2000 TRI and PCS.

Table 1-11. List of Facilities in TRIReleases2000

SIC	Facility Name	City	State	Discharge Type	TWPE
8062	U.S. VA Togus VA Med/Regional Office Center	Togus	ME	No Disch	
8063	VA Hudson Valley Health Care System Castle Point	Castle Point	NY	??	
8063	VA Hudson Valley Health Care System Montrose Camp	Montrose	NY	Direct	365

8063	VA Hudson Valley Health Care System Montrose Camp	Montrose	NY	Indirect	358

Table -12. List of Facilities in PCSLoads2000

SIC	Facility Name	City	TWPE	NPID	Major/ Minor
8062	Castaner General Hospital	Lares	4.4	PR0025283	Major
8062	U.s.m.c. Development &Education	Quantico	0.069	VA0002151	Major
8063	Marlboro Psychiatric Hosp Stp	Marlboro	0.36	NJ0022586	Major
8062	Caritas Southwood Hospital	Norfolk	0.364039	MA0102288	Minor
8062	Clara Maass Medical Center	Belleville	6.72E-02	NJ0032280	Minor
8062	Diagnostic & Treatment Center	Naguabo	194.5359	PR0023183	Minor
8062	Franciscan Medical Center	Dayton		OH0127019	Minor
8062	Gibson General Hospital	Princeton		IN0056626	Minor
8062	Harbor Hospital Center	Baltimore	0	MD0064475	Minor
8062	Huron Memorial Hosp	Bad Axe	7.916473	MI0037508	Minor
8062	Jefferson Co Medical Ctr Plt	Louisville	1.912969	KY0053783	Minor
8062	Miami Valley Hospital	Dayton		OH0115762	Minor
8062	Montana Behavioral Health Inc.	Butte	24.86648	MT0021431	Minor
8062	Morton Plant Health System	Clearwater	5.862706	FL0168831	Minor
8062	Owensboro Mercy Health System	Owensboro		KY0100498	Minor
8062	Quality Health Service of Pr	Ponce	327.0937	PR0025895	Minor
8062	Red Bird Mission Hospital	Queendale	0.176617	KY0026000	Minor
8062	Ri Mhrh Facilities & Maint.	Cranston	8.68E-02	RI0020176	Minor
8062	Rockford Memorial Hospital	Rockford	0.572972	IL0073580	Minor
8062	Union Co Methodist Hospital	Morganfield	2.90E-02	KY0022993	Minor
8062	Usvah - Ft Lyon (E)	Fort Lyon	70.80236	CO0020249	Minor
8062	Veterans Administration Medica	Togus	10.07631	ME0000736	Minor
8062	Zambarano Dr. U.E. Mem. Hosp.	Wallum Lake	209.9387	RI0100129	Minor
8063	Brook Lane Psychiatric WWTP	Hagerstown		MD0053198	Minor
8063	Carrier Foundation STP	Belle Mead	0.174901	NJ0023663	Minor
8063	Choate Mental Health&dev Ctr	Anna	0.205647	IL0070033	Minor
8063	Greystone Park Psych Hospital	Greystone Park	0.271731	NJ0026689	Minor
8063	Hastings Regional Center	Hastings		NE0125016	Minor
8063	Logansport State Hospital	Logansport	0	IN0038521	Minor
8063	Muscatatuck State Dev. Center	Butlerville	0.111432	IN0038539	Minor
8069	McDowell Appalachian Reg Hosp	McDowell	6.10E-02	KY0085791	Minor

SIC	Facility Name	City	TWPE	NPID	Major/ Minor
8069	No Princeton Developmental Ctr	Skillman	2.108294	NJ0022390	Minor
8069	Nursing & Personal Care Home	Bruce	2.150472	MS0032051	Minor
8069	Woodward Resource Center	Woodward		IA0063916	Minor

On-Site Wastewater Treatment/Pretreatment

EPA's 1989 PDS states that hospital wastewater is primarily domestic in nature. Although some additional pollutants are added to the wastewater (e.g., solvents, metals, and chemical products), they are generally treated at the point of generation or mixed with other wastewaters and diluted prior to discharge. As a result, effluent concentrations for hospitals are very similar to domestic wastewater without the need for a centralized on-site wastewater treatment system. The PDS did not address the concern of pharmaceuticals in wastewater, which is discussed in the Raw Wastewater Section of this report.

Pretreatment at hospitals may consist of the following technologies:

- Solvent recycling and reclamation (through distillation) for xylene and ethanol;
- Dilution or decay of radioactive materials;
- Silver recovery for X-ray wastes;
- Acid neutralization (through use of limestone) in the laboratories;
- Grease traps in the cafeteria and kitchen; and
- Plaster recovery in the room where casts are fitted.

A majority of healthcare facilities discharge wastewater to POTWs. These facilities complete discharge monitoring reports (DMR) according to their state, tribal and local water discharge guidelines, but there is not a centralized data collection system for the information.

Hospitals that discharge directly and have greater than 1,000 occupied beds are covered by 40 CFR Part 460. They generally have on-site biological treatment in addition to the pretreatment listed above. The most common type of biological treatment is the trickling filter. Other technologies in use include activated sludge and aerated lagoons.

Multimedia Environmental Releases

Hospitals generate infectious (red bag or biohazard) waste, hazardous waste, solid waste, and volatile air emissions. OSHA and RCRA regulate the largest hospital waste stream: solid and hazardous waste. OECA's Healthcare Sector Notebook[10] provides detailed information on

[10]U.S. EPA Office of Enforcement and Compliance Assurance. *Profile of the Healthcare Industry*. EPA/310-R-04-001. September 2004. Available online at: http://www.epa.gov/Compliance/resources/publications/assistance/sectors/notebooks/health.html.

multimedia releases from hospitals.

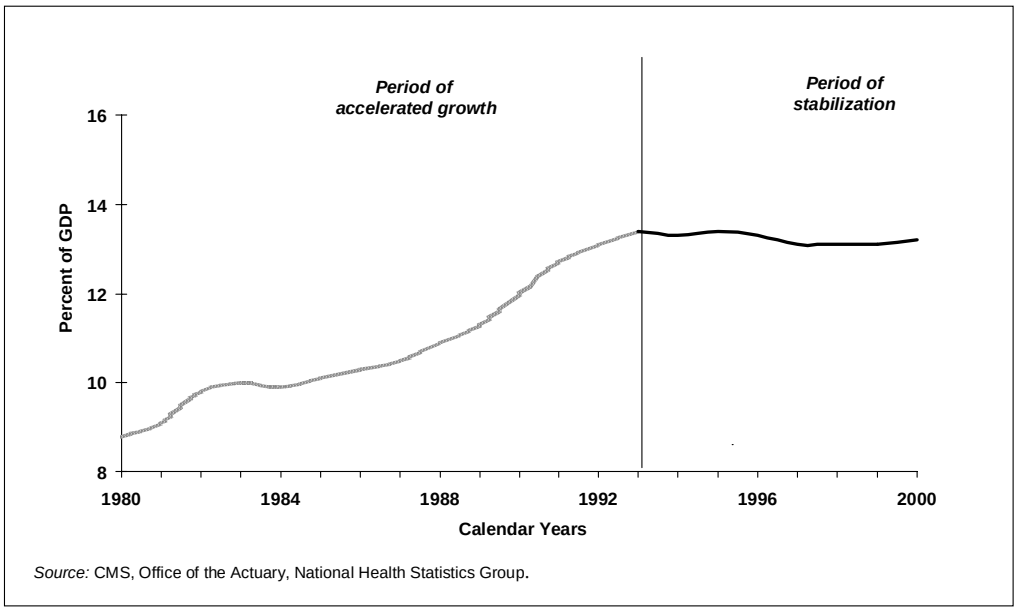
Industry Trends and Trade Associations

The following is a summary of information on Economic Trends from OECA's Healthcare Sector Notebook (Section 6.1).

Healthcare Expenditures as a Share of the Gross Domestic Product

According to the Centers for Medicare and Medicaid Services (CMS), the healthcare industry currently accounts for approximately 13 percent of the Gross Domestic Product (GDP) of the United States. By the year 2010, healthcare expenditures are expected to increase to 17 percent of the GDP. As shown in Figure 1-1 below, the growth of spending has stabilized since 1993 because medical prices averaged only a 2.9 percent annual growth between 1993 and 1999. This growth is relatively minimal compared to the 11.2 percent average annual growth between 1980 and 1982, and the 6 percent average annual growth between 1982 and 1993. Another factor to consider in this stabilization is the growth in the complementary care industry (i.e., non-allopathic healthcare services), which was reported to be approximately 42 billion dollars in the mid 1990's.

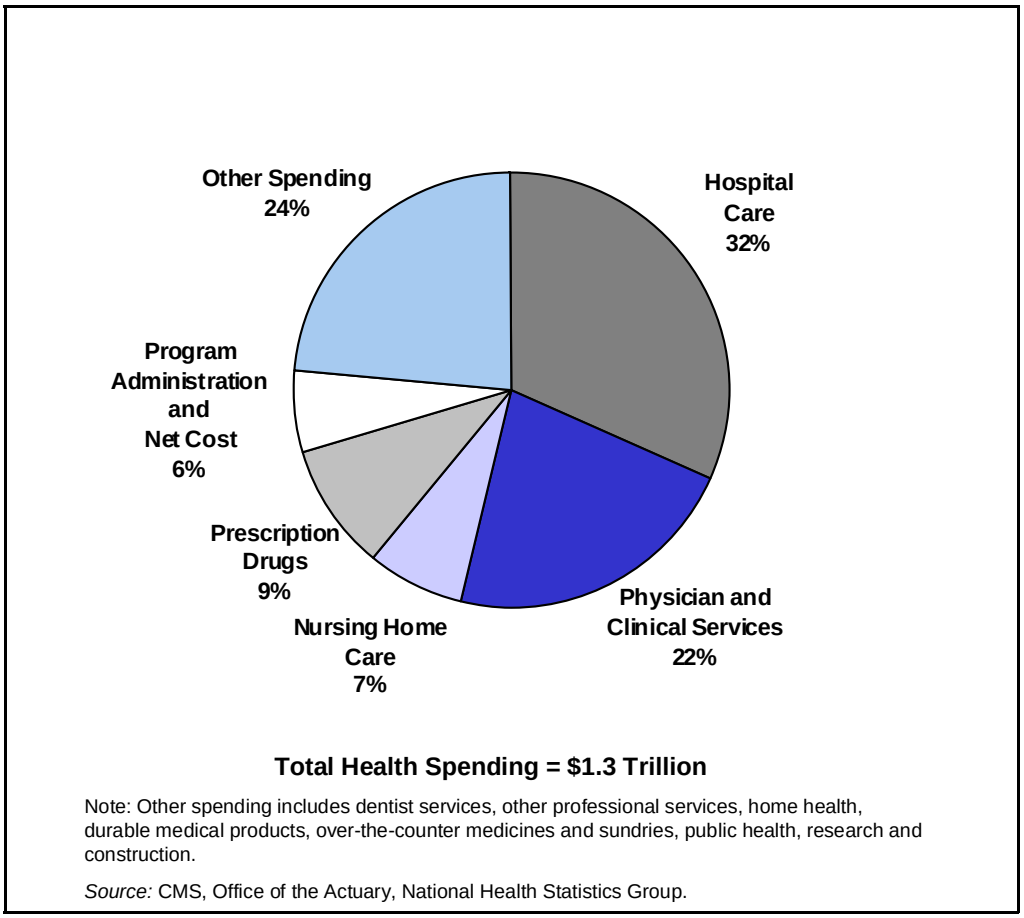
Figure 1-1: National Healthcare Expenditures as a Share of the GPD



Source: June 2002 Centers for Medicare and Medicaid Services Report.

Healthcare Spending

In calendar year 2000, the United States spent $1.3 trillion on healthcare (NAICS code 62). Most of this money was split between hospital care (32 percent) and physician and clinical services (22 percent).



As shown in Figure 1-2 below, prescription drugs accounted for 9 percent of the total healthcare spending in 2000. According to the CMS, between 1990 and 2000, prescription drug spending increased by more than 3 percent while the amount of money spent at hospitals decreased by 4.8 percent.

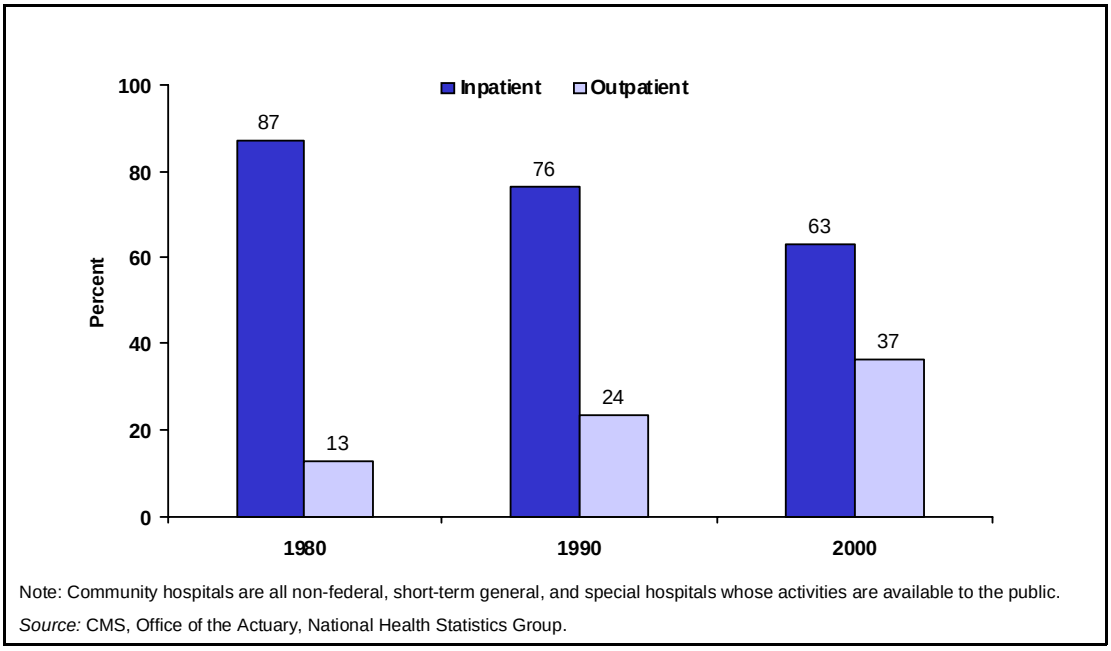
Figure 1-2: The Nation's Health Dollar, CY 2000

Source: June 2002 Centers for Medicare and Medicaid Services Report.

Inpatient Care Versus Outpatient Care

The implementation of Medicare prospective payment systems and the increased enrollment into various managed care programs, has been a contributing factor in the decreased length of patient hospital stays since 1980. According to the CMS, in 1980, the average length of a hospital stay was between 7 and 8 days. In 1999, it was approximately 2 to 3 days. These factors, along with advances in technology and pharmaceuticals available to treat diseases, have also led to a decline in the number of inpatient hospital procedures. As shown in Figure 1-3 below, inpatient care accounted for 87 percent of hospital procedures in 1980. In 2000, that number was down to 63 percent.

Figure 1-3: Community Hospital Expenditures: Inpatient and Outpatient Shares for All Payers



Note: Community hospitals are all non-federal, short-term general, and special hospitals whose activities are available to the public.

Source: CMS, Office of the Actuary, National Health Statistics Group.

Source: June 2002 Centers for Medicare and Medicaid Services Report.

Pollution Prevention

In 1998, EPA entered into a MOU with the American Hospital Association which calls for: (1) virtually eliminating mercury-containing waste by 2005; (2) reducing the overall volume of all environmental releases by 33 percent by 2005 and by 50 percent by 2010; and (3) identifying hazardous substances for pollution prevention and waste reduction opportunities, including hazardous chemicals and persistent, bioaccumulative, and toxic pollutants. The H@E effort educates health care professionals about pollution prevention opportunities in hospitals and health care systems. Through activities, such as the development of best practices, model plans for total

waste management, resource directories, and case studies, the project hopes to provide hospitals and health care systems with enhanced tools for minimizing the volumes of waste generated and the use of persistent, bioaccumulative, and toxic chemicals. Such reductions are beneficial to the environment and health of our communities. Furthermore, improved waste management practices will reduce the waste disposal costs incurred by the health care industry. For more information see the web site for Hospitals for a Healthy Environment (H2E) at http://www.h2e-online.org/ and http://www.hercenter.org/.

The web site for Sustainable Hospitals, http://www.sustainable hospitals.org/ provides technical support to the healthcare industry for selecting products and work practices that reduce occupational and environmental hazards, maintain quality patient care, and contain costs. This site focuses on mercury-free products and other pollution prevention opportunities.

The web site for the American Society for Healthcare Environmental Services (ASHES), http://www.ashes.org/, provides information on environmental excellence and advances in healthcare environmental services, textile care professions and related disciplines.

There are also a variety of resources on water conservation available to the healthcare industry. Many of these resources are presented on the Hospitals for a Healthy Environment web page for water conservation fact sheets (). Several of these resources are described below in additional detail:

- The document titled "Water Conservation Checklist: Hospitals/Medical Facilities; Every Drop Counts!" published by the North Carolina Department of Environment and Natural Resources Division of Pollution Prevention and Environmental Assistance contains a list of water use areas throughout a hospital and ways to reduce water consumption in each of those areas. This document can be found at: http://www.p2pays.org/ref/23/22006.pdf.

  Based on this document water use in hospitals can be reduced considerably as shown in the following table (also discussed in Section 2):

Types of Water Uses	Average Water Use (% of total)	Potential Savings (% of total)
Cooling	53	32
Domestic	24	10
Cleaning	10	9
Kitchen	5	--
Process	4	--
Other	4	--
TOTALS	**100%**	**51%**

	139,214 gpd	**71,000 gpd**

Source: ICI Conservation in the Tri-County Area of the Southwest Florida Water Management District (SWFWMD). SWFWMD, November 1997.

- The New Hampshire Department of Environmental Services developed an environmental fact sheet titled "Water Efficiency Practices for Health Care Facilities" which also presents practices by water use area. This document can be found at: http://www.des.state.nh.us/factsheets/ws/ws-26-14.htm

- Southwest Florida Water Management District (SWFWMD) also has a similar factsheet titled "Water Conservation @ Work: Hospitals." This document can be found at: http://www.swfwmd.state.fl.us/watercon/waterwork/checkhospital.htm.

- Healthcare Purchasing News has developed a Self Study Series to evaluate environmentally preferable products. One item in this series discusses microfiber mops which use less water than conventional cotton mops. The article discusses the economic, environmental, employee, and patient benefits of using microfiber mops. This document can be found at: http://198.151.15.185/pubs/ShouldYouMicrofiber.pdf

- The University of Wisconsin Cooperative Extension developed a hospital waste reduction checklist which includes strategies for reducing wastewater discharges. These strategies include substitution of less toxic materials, procedures for moving or cleaning sewer lines, traps, or sumps, and chemical storage and disposal options. This document can be found at: http://www.uwex.edu/shwec/Pubs/pdf/425-9602.pdf.

- The Medical Academic and Scientific Community Organization prepared a pretreatment manual for use by hospitals to help solve a sewer discharge compliance problem. The manual outlines the elements of typical source reduction programs and a wastewater pretreatment strategy. This document can be found at: http://www.masco.org/mercury/pretreatment/index.html.

- EPA's Small Business Ombudsman developed a fact sheet for walk-in urgent care facilities and smaller hospitals. The fact sheet explains some of the best management practices (BMPs) related to toxic chemicals or hazardous materials used as part of the diagnostic, treatment, and cleaning processes used in these smaller facilities. This document can be found at: http://www.smallbiz-enviroweb.org/html/pdf/BMP_HealthCare-4.pdf.

- EPA Regions 1 and 2 have on-going programs to provide information to help healthcare facilities reduce environmental impacts of their operations and improve their understanding of and compliance with environmental regulations. The EPA programs also help facilities realize the cost savings and environmental benefits that can be attained through improvements in recycling, energy efficiency and water conservation. More information can be found at: http://www.epa.gov/region1/healthcare/ and

http://www.epa.gov/region2/healthcare/.

With respect to controlling mercury discharges, healthcare facilities contain mercury in some medical equipment (e.g. pressure gauges, thermometers), laboratory reagents, and common facility items (e.g., fluorescent lights, thermostats, cleaning supplies). Some hospitals approached the problem of mercury use within their facilities by following some basic steps, including:

- Conducting inventories to identify sources of mercury within their facilities;
- Making recommendations to existing hazardous waste and safety committees and the administration for reducing or eliminating these sources;
- Instituting immediate steps for mercury reduction; and,
- Devising long-term goals for the virtual elimination of mercury from their facilities.

An example of this approach was documented at two major Detroit hospitals that instituted mercury pollution prevention plans. Wastewater sampling was conducted to evaluated their performance. Before the mercury pollution prevention program, mercury measures at these sites were in the range of 0.28 ppb to 0.96 ppb. After the program was instituted, these figures dropped to 0.09 ppb to 0.15 ppb.[11]

References

1. Centers for Medicare and Medicaid Services Web Page. http://www.cms.hhs.gov/charts/healthcaresystem/chapter2.asp, accessed 10/22/04.

2. Hospitals for a Healthy Environment Web Page for Water Conservation Fact Sheets (http://www.h2e-online.org).

3. U.S. EPA Office of Water and Hazardous Materials. *Development Document for Interim Final Effluent Limitations, Guidelines and Proposed New Source Performance Standards for the Hospital Point Source Category*. EPA 440/1-76/060n. April 1976.

4. U.S. EPA Office of Enforcement and Compliance Assurance. *Profile of the Healthcare Industry.* EPA/310-R-04-001. February 2005.

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